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Jascha Camilo Klenk

BEHAVIORAL ECONOMICS: THE IMPACT OF NEWS ON INVESTOR SENTIMENT IN FINANCIAL MARKETS

São Paulo – Lisbon
2016

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Behavioral economics: The impact of news on investor sentiment in financial markets

Dissertation written as part of the Double Master's Degree Program between Insper and Nova SBE to obtain a Professional Master in Business Administration (Insper) and an International Master in Management (Nova SBE).

Concentration: Behavioral Finance

Supervisors:

Prof. Gazi Islam – Insper
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São Paulo – Lisbon
2016

Klenk, Jascha
Behavioral economics: The impact of news on investor sentiment in financial markets/ Jascha Klenk – São Paulo/Lisbon, 2016.

Dissertation (Double Master's Degree – Professional Master in Business Administration and International master in Management. Concentration: Behavioral Finance) – Insper and Nova SBE

Supervisors: Prof. Gazi Islam (Insper) and Prof. Dr. Miguel Pina e Cunha (Nova SBE)

1. Behavioral finance 2. News coverage 3. Efficient Markets 4. Investor Sentiment

APPROVAL FORM

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Approved on: 19/04/2016

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ACKNOWLEDGEMENTS

I would like to thank the following people and institutions for their support in completing this work.

My Brother, for giving me inspiration and supporting my academic and professional choices, and always being there for me.

My Parents, for always showing the highest level of interest in my academic path and choices and for motivating me one year to the other.

My supervisors, Miguel Pina e Cunha (Nova SBE) and Gazi Islam (Insper), for dedicating time to support me in my work and for providing valuable feedback along the way.

Prof. Priscila Fernandes Ribeiro (Insper), for helping with the statistical evaluation of data.

Prof. Charles Kirschbaum, for showing dedication in helping me with this thesis.

Nova SBE and Insper, for a great international educational experience in two countries that I urge graduate students to consider as valuable choices for their continuing education.

TCP Latam Investment Boutique, for helping me with my research, and supporting my strong dedication to this thesis alongside my work.

EXECUTIVE SUMMARY

Capital markets are said to be efficient if they fully and correctly reflect all relevant information in its prices (Fama, 1970). Based on this idea, the only determinant of a security`s price is their fundamental value, calculated as the present value of discounted expected future cash flows. Because prices already reflect all public information, it is not possible to make abnormal economic profits by analysing the balance sheets, income statements or announcements of dividend changes (Malkiel et al., 1991). The only determinant of expected profit of holding a security is the risk associated with it.

Throughout time, theorists and especially practitioners have challenged this efficient market hypothesis, which found evidence that investors are indeed able to earn excess risk-adjusted rates of return by the help of analysing predictable patterns (Malkiel 2003). One of the first market anomalies challenging the efficiency of financial markets were found by Philip Brown and Ray Bale in 1968, who observed that market prices react sharply to earnings announcements when new information becomes available, and then continue drifting in the same direction for various months.

Because these systematic pricing errors are usually not explainable by market frictions, financial research focuses on the psychological and behavioural elements of stock price determination. In this sense, focus is put on the context in which economic agents make their decisions, and the influence of human feelings such as greed, excitement, anxiety and panic in this decision making process. We will therefore integrate individual and cognitive processes and their particular constraints into economic theory both on individual, and collective level. Because humans show patterns in their behaviour, certain market reactions to putatively irrational human behaviour actually become explainable by the help of “emotional finance”.

Human irrationality is only able to influence market prices if the masses as a whole adapt to certain feelings, emotions or beliefs. Throughout this research we will see that humans actually tend to converge in their belief and perceptions of reality, leading to masses as a whole taking on a certain position. As seen in various examples of bubbles in stock markets throughout history, this generalized belief of

the masses about what is perceived to be true can have drastic impact on valuations and therefore prices of securities.

In analysing which forces lead masses to take on a certain position, we analyse the effects that the media has in influencing the perceptions of investors. The power of the media in influencing these perceptions may not be underestimated, as even sophisticated analysts draw their conclusions on irrelevant aspects of how financial information is presented (Hirst and Hopkins, 1998).

In analysing the influence of the media leading to distorted security prices, we investigate towards the media coverage on United Airlines in the period of 09.08.2008 until 09.14.2008, a period in which the United Airlines stock was undervalued due to a previous false news report about the bankruptcy of the airline. Among other interesting findings, we find that an excessively negative tone in the news coverage regarding United Airlines resulted in the sentiment of investors becoming excessively negative. By the help of this case study, we display the influence of media on human irrationality on prices in financial markets, and determine negative investor sentiment to be the main cause responsible for the undervaluation of United Airline stock in September 2008.

ABSTRACT

This thesis analyses the extent of irrational human behaviour in the financial world, and the implications that these behaviours have on prices in financial markets as a whole. Because this research covers various fields, from general economic theory, over human cognition and group decision making to power of the media, we start out by explaining the link between these areas, by integrating individual and collective cognition into economic theory.

Doing so, we show how an individual's cognition is influenced by its peers and the surrounding, leading to group decision-making, a process in which individuals subordinate their own beliefs under the generalized belief of the group. In this regard a special focus will be put in analysing the effects that the media has in influencing the minds of the masses. We will then go on to investigate towards the effects that irrational investor behaviour has on the prices of believed to be efficient financial markets.

In these introductory sections, this theses complements to behavioural, financial and economic literature by explaining the impact of individual cognition within these already established theories and explaining the role the media has in influencing collective cognition and therefore altering prices in financial markets.

While most of recent research in cognitive science has focused on forming hypotheses and models of cognition and subjecting them to experimentation (Bourgine, 2004), this theses contributes to behavioural and financial research by testing the impacts of certain behaviour paradigms in the case of the United Airline Stock undervaluation in September 2008. Doing so, we empirically analyse the course of this undervaluation, the context in which it occurred and which cognitive phenomena might be responsible for the undervaluation. By means of textual analysis of media coverage regarding United Airlines throughout this episode we explain the influence of the media leading to this mispricing, and ultimately define excessively negative investor sentiment resulting from this media coverage to be the main reason for this undervaluation.

Key words: *Behavioural finance, News coverage, efficient markets, investor sentiment*

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1. INTRODUCTION

The human brain is without a doubt one of the most interesting and fascinating fields of studies: The power that the brain has over the rest of the body can be seen by the example of the "Placebo Effect", where hopeless patients suffering of severe diseases ranging from cancer to Parkinson, have been cured by the sole treatment of plain sugar pills. Only because these patients strongly believe in the efficiency of the "drug", as if by magic, they actually cure their disease by themselves. This effect illustrating the power about the human brain over the rest of the body can therefore be described as the "most effective medication known to science, subjected to more clinical trials than any other medicament yet nearly always doing better than anticipated. The range of susceptible conditions appears to be limitless"(O´Donell, 1995 p.1).

The placebo effect outlines the power that perceptions about what is believed to be true have not only over the body, but also over general human behaviour and emotions or decision-making. In this sense, psychologists as well as economists have been studying various cognitive phenomena in order to understand certain putatively completely irrational human behaviours for long periods of time. These behaviours are extremely interesting to observe in a business context; an area in which rational decision making in order to opportunistically maximize value is one of the main postulates for success (Bourgine, 2004). We will therefore integrate individual and cognitive processes and their particular constraints into economic theory both on individual, and collective level. As we will see throughout this paper, by analysing the behaviour of financial market participants, certain putatively completely irrational behaviours become understandable and might even turn out to be rational.

This thesis analyses the extent of irrational human behaviour in the financial world, and the implications that these behaviours have on financial markets as a whole. In this sense, a focus will also be put on the emotions leading individuals to make certain putatively completely irrational investment decisions. As we will see, throughout the process of price finding for securities, general investor sentiment as "a belief about future cash flows and investment risks that is not justified by the facts at hand"(Baker and Wurgler, 2007) regarding the economy in general or about a certain security in specific play a vital role. We will analyse in depth, how negative investor

sentiment evolves and which impact the media has in generating it: Different media sources are accessible regardless of place and time, due to technological progress over time. It is extremely challenging for the human brain to distinguish from which sources of media to rely on, in a world where one is confronted with numerous different, partially contradicting information and opinions (Engelberg and Parsons, 2011). In this sense the impact of the media not only on the efficiency of markets, but also on the sentiment of financial market participants are analysed.

This paper builds up on existing literature on behavioural finance theory. Here a special focus will be put on the effects of negative affectivity, as humans prove to wrongly assess risk due to a misperception of reality resulting from negative emotions. Because human emotions and irrationalities only effect financial markets when the masses as a whole adapt certain behaviours, a focus will be put in understanding how certain human mind sets and behavioural paradigms are adapted by many people, leading to "group think" or even mass movements, ultimately distorting prices on financial markets.

Whereas most behavioural economics models are quite abstract and theoretical, this theses complements research by the means of empirical qualitative and quantitative research. In this sense, this thesis builds up on previous research from the area of behavioural economics. We analyse various relevant behavioural economics theories and bring them into context of real life financial markets. Doing so, we empirically analyse and validate the implications of various behavioural finance models by analysing the mispricing of United Airline (UAL) Stock in September 2008: On September 8th of 2008, a six-year old newspaper article about United Airlines filing for Chapter 11 was mistakenly republished online. The market reacted with a plunge of the airline`s share price from $12 to $3, which can be seen as a sign for efficient markets, in which the new information is incorporated into the new price. Yet, only shortly after, this information was revised, and it took six trading days for the share price to return to pre-event levels. This intensive case study analyses all factors contributing to the undervaluation of this security. We will do an in depth analysis of the previously explained theories on behavioural economics, and analyse the role of the media in this surrounding, and the implications that is has on behaviour of agents. Among other interesting human information processing phenomena and emotions, we will identify negative investor sentiment due to

excessively negative media coverage in this episode to be one of the main explanations for this mispricing puzzle.

This thesis is built up as follows: After an outline about group information processing, the implications that human cognition has on financial markets will be explained in chapter 3. Doing so, the efficiency and limitations of financial markets will be explained from a behavioural perspective. The following fourth chapter explains the role of the media in influencing the perceptions of humans, and how they can affect prices on financial markets. We will then go on by constructing an in-depth analysis of the case of the United Airline Stock undervaluation from the period of 09.08.2008 until 09.14.2008.

2.GROUP INFORMATION PROCESSING

2.1 Emotional Convergence

This thesis investigates towards how human mind-sets, their perceptions and emotions effect their economical actions and decisions. In this sense, every human being is unique in which motivational forces and rationalities drive him/her to act in a certain way. Yet, humans show certain behavioural paradigms and patterns in their actions. (De Martino, Kumaran, Seymour, Dolan, 2006) In order to analyse the effects of human (ir)rationality on the marketplace, it is necessary to analyse the whole of market participants, by aggregating individual behaviour to behaviour of the masses.

Experimental studies on different reference groups such as people in relationships or college roommates as done by Anderson and John (2003) have proven that people in fact converge in their emotional mind-set. By the help of coordination of certain thoughts and behaviours, mutual understanding and agreement is increased. This in turn leads to stronger emotional similarity, which brings about certain benefits such as cohesiveness in decision-making and problem solving (Anderson and John, 2003). These studies prove how originally unique human beings converge to be more alike to their peers, influencing their perceptions, opinions and decisions.

The effects that the surrounding has on ones own actions can be compared to individual behaviour in groups: Despite the benefits of discursive decision-making of

heterogeneous groups, groups in practice tend to adapt to a behavioural phenomenon called “Group Think”(Janis, 1972). Due to the diversity in opinions, perspectives, talents and insights, groups should be better in decision-making than individuals by themselves. The full use of all the information available to the group by exchanging, discussing and integrating the information distributed over the group members in theory leads to a superior decision making. Yet, research shows that groups in practice are poor users of this distributed information, as individuals focus more on already evident common knowledge or assumptions. Because group members are oftentimes not as open to new information, too easily satisfied with an emerging consensus and hesitant to move against this consensus, a low level of information elaboration, following low-quality decisions is very common (van Knippenberg et al., 2010). Groups fail to discuss individual group members’ unique information, but instead rather focus more on information known to all members before discussion (Stasser and Titus 1985). The “group think” phenomenon can therefore serve as theoretical basis, explaining how it is possible that originally unique humans merge in their opinions and especially actions towards a “mainstream” consensus.

2.2 Groupthink

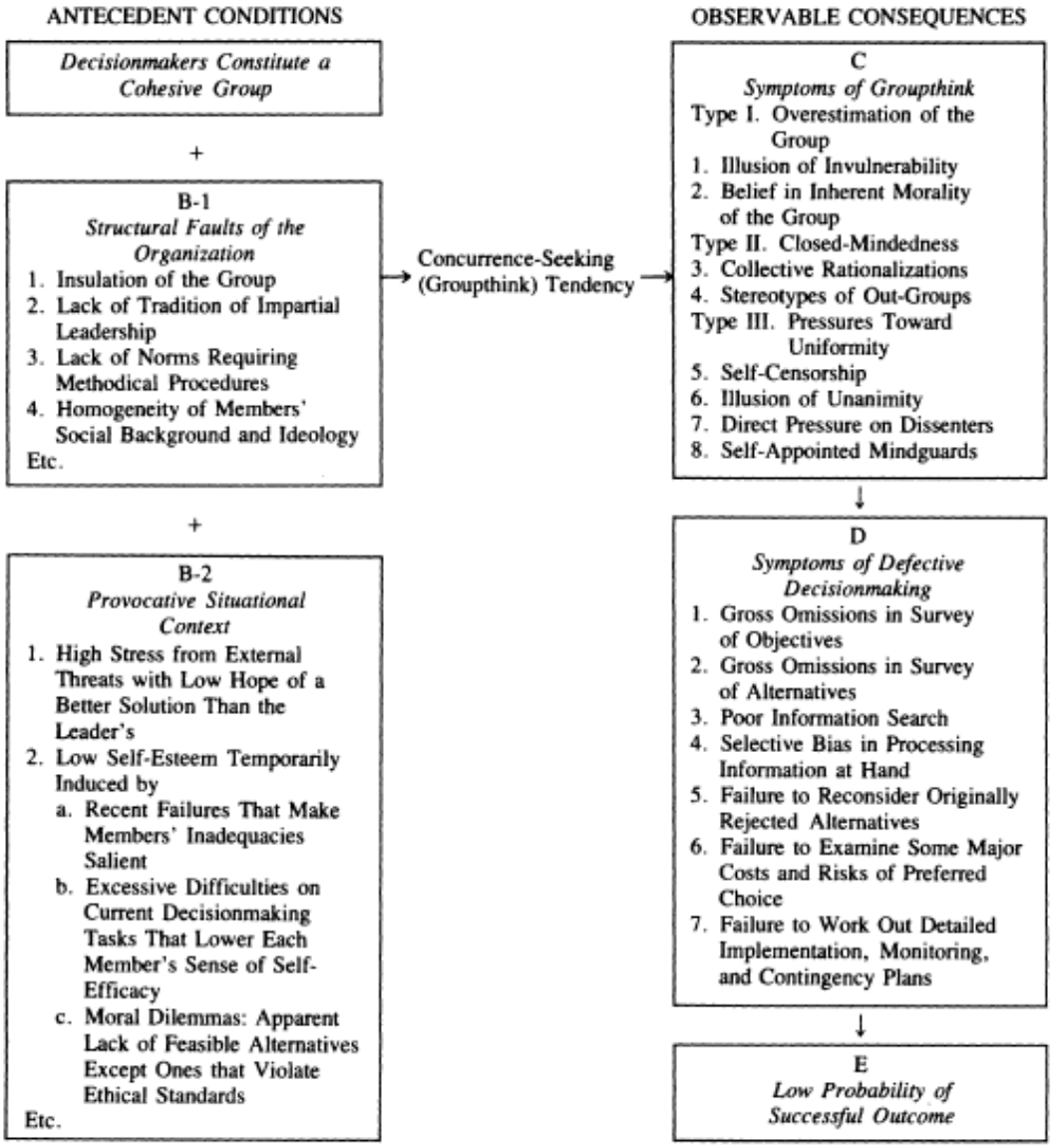
Irving Janis (1972) first published his idea of “Groupthink” as a form of group behaviour, in which involved individuals limit the thinking for themselves. Janis analyses what occurred in the Kennedy White House before the Bay of Pigs invasion by means of psychoanalytic understanding of the structural characteristics of the organizational context, in which the CIA representatives dominated the decision making process. Based on his findings, he coins the term groupthink as “a mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members striving for unanimity override their motivation to realistically appraise alternative course of action” (Janis, 1982 p.9)

Groupthink can be considered a feature of a “basic assumption group” as coined by Bion (1952). In this basic assumption group, instead of processing information to reflect on risk and return as external realities/conditions, agents treat information from outside of the group only as “background noise”, ignoring alternatives, and feeling secure by everyone doing the same. In this sense, group

members are afraid of being left out and are instead united by their common belief in a supporting “cover story”. In contrast to a basic assumption group, a “Work Group” is defined as one in which each individual thinks for himself, and uses the group to test and elaborate rather than to conform.

Groupthink stands for an excessive form of concurrence seeking among members of high prestige groups. It is excessive because group members value the group and being part of the group extremely high. Members strive for quick and smooth unanimity on the issues that the group confronts, also by suppressing personal doubts. A strong confidence in the inherent morality of the group, combined with an evil picture of the groups opponents serve as justification for silencing dissenters. Depending on the surrounding, this can lead to dramatic consequences such as a distorted view of reality, excessive optimism producing hasty and reckless policies, or neglect of ethical issues. Because of these weaknesses and reduced self-questioning and self-reflecting, these groups are kin to initiate certain projects that result in fiascos. A grouping is especially vulnerable to groupthink, when its members are similar in background, when the group is insulated from outside opinions and when are no clear rules for decision making within the group (Janis, 1982)(Hart, 1991).

Figure 1: Groupthink theory: A model.



Source: Janis, (1982)

The flowchart above explains the operational and causal connection between antecedents, indicators and effects: The decision makers constitute a cohesive group by taking advantage of structural faults of the organization in a proactive situational context. The tendency of concurrence seeking then leads to the groupthink with its characteristics such as overestimation of the group, closed-mindness and pressures toward uniformity. These mechanisms usually lead to defective decision making with low probability of succeeding (Janis 1982).

From a psychoanalytical perspective, a conflict in mind takes place, leading to a "divided rationality": Instead of experiencing emotional conflict, agents cut themselves off from being aware of it, in order not to feel frustrated nor anxious and

be able to excitedly take on certain behaviours without feeling bad about them (Tucket, 2009). This divided rationality is contrasting to an “integrated state” of mind, in which the human being thinks about themselves, others and other things more or less objectively the way they are. Certain attributes produce mixed feelings including guilt and regret. As this realistic appraisal of the surrounding including the previous attributes are not present in a “divided” state, a person in a divided state does not experience the consequences of their own imperfections.

As we will see throughout this theses, the price-finding in stock markets can be compared to a group decision making, as the market as a collective brings about information and opinions from many individuals, aggregates them, ultimately resulting in an equilibrium price, which could be seen as the group consensus. Examples of evident group think mechanisms in financial markets, as well as the possible consequences and responses after detecting this will be outlined. Many of the previously outlined characteristics of “group think” are present in the UAL case, leading to the poor decision making, ultimately resulting in extreme undervaluation of the UAL Stock in September 2008. In this episode, the masses (“groups”) have taken on excessively negative perceptions about reality, and were no longer capable of making reasonable judgments about the fundamental value of the stock. Based on Janis’ definition of Groupthink, it becomes evident, that Investors striving for unanimity have overridden their motivation to realistically appraise alternative course of action for a very long period of time.

2.3 Negative Affectivity

The fact that emotions and moods play a great role in individual as well as collective behaviour has been scientifically proven and is undeniable (Andrade, 2009). The general concept of affect captures the disposition to experience positive and negative feelings as well as positive and negative transition mood states (Watson and Tellegen, 1985). Affective states have an important signalling function, as they signal whether a certain state or thing requires attention and potential action, or if it is satisfactory. In this sense, moods are considered as low-intensity affective states, which do not have the intensity of emotions, and are actually associated with more extensive information processing. Emotions, which are more intense, usually rather short-lived and in contrast to diffuse moods have a distinct cause, are problematic as

they are associated with impaired cognitive capacity for information processing. Extremes such as clinical levels of negative affectivity e.g. can lead to dysfunctional consequences.

Negative affectivity could be described as the disposition to experience subjective distress (Watson and Clark, 1984). In this sense, the disposition to feelings such as sadness, guilt, nervousness etc. contributes to the level of experienced negative affectivity. There has even been research suggesting that moderate levels of negative affectivity are actually associated with more careful and extensive information processing as well as openness and attention to new information (van Knippenberg et al, 2010). By an evidence-driven (rather than preference driven) processing-style, which focuses on external/situational relevant information, moderate levels of negative affectivity indirectly influence the cognitive effort and processing capacity. Especially in group decision-making, the positive effects of moderately high levels of negative affectivity may even motivate more appropriate responses to certain situations by improved information processing (van Knippenberg et al, 2010). Yet, these previous findings are highly disputable. There has been contrary line of research suggesting that positive affectivity is more efficient in bringing about desirable outcomes, by increased cooperation and coordination within groups, (Barsade et al., 2000) , or by increased creativity (Baas, De Dreu and Nijstad, 2008). Additional research seems to prove that positive moods lead to group members making better use of their distributed information due to cognitive flexibility of happy individuals yielding improved results (Bramesfeld and Gasper 2008).

Research on negative affectivity has shown that negative affect renders individuals to be more risk avoidant in their decision-making (Williams, Zainuba and Jackson, 2003) From this it is possible to conclude that negative effect is less conductive to performance in certain surroundings such as research and development teams, that highly rely on creativity, but also the finance industry in which agents need to take certain calculated risks.

Based on the fact that the UAL stock was drastically undervalued in the regarded period of September 2008, we conclude that investors were not able to make reasonable judgements about the true value of the stock. Based on the previously outlined theory, we expect this to be due to strong negative emotions, which negatively influence the human cognitive capacity for information processing. But how can it be possible that this negative affective state of investors becomes

established, and how is it possible that certain (irrational) investor behaviours actually influence security prices in efficient markets, letting them diverge from the former market equilibrium? Based on the assumption that financial markets are efficient, the limits to this efficiency are analysed by investigating towards the effect that apparently irrational human behaviours in practice prove to have on financial markets.

3. BEHAVIORAL FINANCE

3.1 The Efficient Market Hypothesis

The Efficient Market Hypotheses (EMH) as defined by Eugene Fama in 1970, defines an efficient financial Market as one in which security prices always fully reflect the available information. Therefore, actual market prices reflect the fundamental values of securities. The rationale is that as soon as information arises, it is spread very quickly and incorporated into security prices without delay. Because of this, the only determinants of security prices are their fundamental values, calculated as the present value of discounted expected future cash flows. The expected profit of holding a security is a function of the securities risk (Fama, 1970). The EMH is divided into the semi-strong form, stating that prices reflect all publicly available information, and the strong form, stating that none of the market participants can generate long-term excess returns through any kind of analysis.

In compliance with the EMH, the random walk model states that successive price changes are independent from one another and identically distributed (Fama, 1965). Only the emergence of new, unpredictable, information will lead to a change in stock prices. Following this logic, the change of a stock price in the future is independent from previous price changes, and unpredictable. Because of this, it is not possible for any investor to generate abnormal returns by technical analysis (The attempt to predict future stock prices by studying past stock prices) or by fundamental analysis. The inability of professional money managers to beat the market as proven by Rubenstein in 2001 is seen as strong evidence of the EMH (Barberis and Thaler, 2003).

Markets are efficient because of the competition among investors: Investors spend time and resources in the attempt to identify mispriced securities. Doing so, competing investors buy and sell these mispriced securities, making the prices

converge to an equilibrium efficient price in the long run. Mispricings are assumed not to last, and abnormal returns are only possible by chance. Because of this efficiency, informed as well as uninformed investors generate equal levels of profits, which are a function of a security`s risk. In consistency with this, financial theory generally states that there is "No free lunch" in stock markets.

One reason for the popularity of the EMH is that it rationalizes the finance industry on the base of rational individuals. Yet, humans as economic agents are error-prone, with judgement mistakes and other sentiments leading to a range of important anomalies.

As we will see in the analysis of the United Airlines case from 2008, sharp price movements underline the efficiency of markets. Stock prices react by incorporating the impact of new information immediately. In the case of a news release regarding the fundamental value of a security, it is expected that stock prices move quickly towards a new equilibrium price, which incorporates the new information. If this news turns out to be false, a price revision, back to previous levels as soon as the correction of the false news is released is expected.

3.2 Anomalies challenging the Efficient Market Hypothesis

Throughout time, the intellectual dominance of the efficient market hypothesis became far less popular, as many financial economists and statisticians started believing that stock prices are at least partially predictable. In this sense, the psychological and behavioural elements of stock price determination play an important role. These economists challenging the EMH have found evidence that by the help of predictable patterns, investors are able to earn excess risk-adjusted rates of return (Malkiel, 2003).

One of the main important patterns challenging the EMH, which have been found, is the "Post Earnings Announcement Drift (PEAD)". The PEAD phenomenon has first been reported by the two accounting professors Philip Brown and Ray Bale in 1968, who observed that markets react sharply to earnings announcements over the course of a few days and then continue drifting in the same direction for various months (Ball and Brown, 1968). In contradiction to the EMH, stating that stock markets have no memory (The way stock markets behaved in the past is not useful in divining how it will behave in the future), the PEAD describes a phenomenon in

which the contrary is the case. Whereas theory would expect sharp stock price movements within minutes, following stability until new news releases, the empirical findings are contradictory and they therefore also seem to offer an arbitrage opportunity: A rational investor could create a hedged portfolio that is long in firm(s) that have just announced good news and short in firms that have announced bad news, resulting in risk-free returns from no net investment (Bloomfield, 2006). The understanding of this arbitrage opportunity should theoretically lead competing investors to buy this PEAD portfolio, and drive prices to an equilibrium, in which these excess returns are eliminated. Yet, this phenomenon has proven to be robust in practice.

The PEAD is only one of many pricing anomalies, each of which is controversial and explained by different approaches. Among the most puzzling, EMH contradicting phenomena are:

- The equity premium puzzle: The returns on equities seem to be far too high in comparison to bonds even when accounting for the additional associated risk (Mehra and Prescott, 1985).
- Excessive volatility: Market prices have proven to be excessively volatile relative to the volatility of fundamentals (Shiller, 1981).
- Excessive volume: Trade volume is far too high than can be explained by new fundamental information or non-informational motivations such as liquidity need or risk hedging (Kendel and Pearson, 1995).
- The accruals anomaly: Firms with large positive accruals earn lower future returns than firms without small positive accruals (Sloan, 1996).
- The momentum effect: The tendency for rising asset prices to rise further and for falling asset prices to fall further (Jagadeesh and Titman, 1993).

There have been many attempts to explain these previously listed as well as other pricing anomalies such as our regarded UAL under-pricing case e.g. by the help of risk premiums or liquidity preferences of investors, yet almost all of these explanations have failed. As we will see, there are certain limitations to investors in exploiting arbitrage opportunities, as we will see in the following section. Yet, depending on the concrete market anomaly (e.g. UAL under-pricing in September 2008), it is oftentimes more likely that irrational investor behaviour is responsible for these anomalies, and will therefore be examined in section 3.4.

3.3 Limits to arbitrage

As outlined in the previous section, investors make systematic trading errors that result in mispricing. In line with the EMH, the question naturally evolves of why don't smart traders exploit these errors, by buying under-priced and selling over-priced securities, therefore driving prices to appropriate levels? And how is it possible that obviously mispriced securities don't converge to an equilibrium price, but instead diverge even further from the fundamental value, as proven by the momentum effect?

Great parts of this puzzle can be explained by the theory of limited arbitrage, which states that certain other risk factors, which are not captured as risk factors in traditional asset pricing models, prove to limit the possibility of arbitrage. These risks are incorporated in the theory of "noise trader risk": Because of temporary price movements even further away from fundamental value due to irrational "noise traders", the value of an arbitrage portfolio may decline. Even though the arbitrage opportunity is greater, the further the price is away from fundamental value, fund managers are oftentimes forced to liquidate their positions. They are therefore not able to take advantage of an apparent arbitrage opportunity. This is because the investors of these funds evaluate them on short-term performance, and might withdraw their investments because they see short-term losses as signs for poor investment strategy (Abreu and Brunnermeier, 2002). Besides this, professional arbitrageurs face liquidity problems in practice due to the "holding costs" they are facing: The proceeds from short-selling an overpriced asset, as well as additional collateral (which could otherwise be invested more profitably) are put into a minimal or no interest paying margin account. These additional holding costs also include the relative performance evaluation of fund managers or the risk that the lender of a security might recall the asset (Abreu and Brunnermeier, 2002).

Besides these limits to arbitrage, a model constructed by Dilip Abreu and Markus Brunnermeier (2002) proves that even for rational investors, in certain situations it might be more lucrative to exacerbate pricing errors rather than to counteract against them: In a situation in which irrational traders drove security prices too high, even rational traders might "ride the bubble", therefore continuously enlarging it. The rationale is that a rational arbitrageur does not know weather other arbitrageurs have recognized this mispricing yet, and therefore expect the mispricing

to last temporarily. The consequence, is a “delayed arbitrage”, in which mispricing is resistant to arbitrage in the short and intermediate run. The risk resulting from the unpredictable timing of how long a mispricing holds is termed “synchronization risk” (Abreu and Brunnermeier 2002, p.341-344).

Besides these risks, in contrast to theory about perfect capital markets, in reality any kind of arbitrage involves some risk because markets are not complete in practice. Only if a perfect substitute for a mispriced security existed, arbitrageurs would be able to fully hedge their arbitrage positions. Because of these “imperfect hedges”, arbitrageurs fear a fundamental risk arising from the fact that the fundamental value of a hedged portfolio might change over time (Abreu and Brunnermeier, 2002).

In addition, there are a variety of other costs, uncertainties and limitations challenging the EMH due to the fact that financial markets are not perfect in practice. The EMH is based on a set of assumptions: Fama defines (i) no transaction costs in trading securities, (ii) all available information is available costless to all market participants, and (iii) all agree on the implications of current information for the current price and distributions of future prices for each security, as sufficient conditions for market efficiency (Fama, 1970 p.387). The empirical contradiction to these theoretical assumptions is obvious. The reality of imperfect financial markets including asymmetric information leading to adverse selection and moral hazard, limited commitment, supply not equalling demand, and incomplete markets regarding product offering highly restrict the efficiency of markets.

Because of these previously outlined examples of inefficiency, as well as the limits and restrictions that market participants face in exploiting arbitrage opportunities, it becomes clear why certain market anomalies prove to hold over noticeable periods of time. While greater parts of market research and financial literature intends to explain these anomalies by focusing on market frictions and restrictions, we focus on the “behavioural decision theory” branch of psychology, as it turns out to be very well suited to explaining this problem. Researchers have shown “that a variety of apparently irrational behaviours can be explained by a relatively parsimonious set of theories” (Bloomfield, 2006 p.5). In this sense, empirical and experimental studies have proven that the results from these behavioural theories of emotional finance can describe individual investor actions and explain great parts of the previously outlined market anomalies.

3.4 Emotional Finance

Financial markets are subject to human feelings such as greed, over-excitement, anxiety and panic in divided states of mind. In this sense, they produce subjective and neurobiological experience, creating the context for decision-making. Emotional finance is built up on the idea that economic agents make certain decisions based on the context and their subjective experience over time. Because of these propositions about human behaviour, agents make different decisions even if they have the same available information. In this sense, changing preferences, experiences, influences or signals can alter or even reverse personal valuation. Only if agents share the same experiences, context etc., they will make the same decisions (Tucket, 2009).

Decisions can never be taken completely rationally, but are always subject to "Animal Spirits" as defined by Keynes (1936). Because decision-making is also based on macro-economic and wider psychological context-sentiment, it could be called extra-rational rather than irrational (Tucket, 2009). In this sense, feelings are also not irrational. Instead, they could rather be considered as a part of human adaptive capacity, influencing the decision making process. These feelings have a strong impact on professional investors, as they are humans main source of motivation, also for traders or fund managers. Without the feeling one gets from a certain activity, the activity itself actually has little point in doing. In this sense, financial markets are very abstract and cannot be enjoyed for themselves. Simplified, the only value of a security (and the feeling resulting from realizing this value) comes from the price it can be sold for. Because this price and its fluctuations can be observed anytime, financial decisions inalienably involve high ambivalence and stress characterized by inherent uncertainty. This leads to high emotional involvement, with prices strongly influencing the feelings and affect of market participants. The fact that it is extremely difficult to distinguish luck from good judgment in valuing financial decisions causes additional stress and the brain is fooled in its information processing. From a behavioural perspective it now becomes clear that market participants are limited in their cognitive abilities in making rational decisions. We see the great impact that not only emotions, but also the influence of the surrounding on an individual's decision-making process.

3.4.1 Group Think in financial Markets (Bubble evolvement)

The stock crash of 2008 and the following worldwide financial crisis can be seen as an ideal example for emotions influencing decision making and groupthink in financial markets: Various economic factors such as trade imbalances, excess liquidity, depression of risk premia, sinking real estate prices etc. contributed to the economic disequilibrium leading to loss of confidence in financial markets resulting in a stock market crash following the bankruptcy of Lehman Brothers. While all of these economically evident and rationally intuitive factors certainly explain stock market behaviour until a certain point, investigating human behaviour and human information processing shows that human factors are more adequate to understand the root cause of this crash. Human behaviour is always characterized by personal thoughts, feelings and behaviours, meaning that these personal factors are necessarily also present in financial markets (Tucket, 2009). As we will see in further sections regarding the role of the media, as soon as a certain security becomes focus of attention, a collective hype or pessimism can evolve extremely quickly. As we have seen, judgment decisions about the assessment of risk and success can be systematically comprised to the fact that excitement of potential gains is disconnected from the anxiety of potential losses. Aggregated, this can lead to groupthink phenomenon and can consequence in price bubbles. Throughout this process, beliefs about the value of a security are modified and the normal sense of balance between risk and return is replaced by the "generalized belief".

This same mechanism took place in the bubble preceding the crash in 2008, when various agents such as investment fund managers, banks, or insurance companies were offered the opportunity to increase their returns be securitizing loans in increasingly complex, oftentimes even unintelligible packages. The doubts about these packages were dismissed or rationalized, and replaced by excitement about excess returns or even euphoria. But not only these professional money managers, but also the wide masses became victims of this group think: Individuals bought real estate at prices higher than they could ever afford, taking on excessive debt, without questioning whether they will ever be able to repay their mortgages, only because of the generalized belief that everyone could benefit from ever rising real-estate values. Only after long periods of increased discomfort, these packages were questioned,

finally resulting in a panic. These bubbles usually burst not because new information becomes available but rather because what has always been available to be known becomes salient in a way it can no longer be ignored. Collective blaming of those who are putatively responsible for the whole process is characteristic for the aftermath. Personal guilt is not present, and individual contribution to the process excused by alleged necessity to follow the trend (Tucket, 2009).

John Milton Keynes addressed this tendency of people to conform to the average, mainstream judgment. He termed “conventional judgment” to be caused by “the psychology of a society of individuals each of whom is endeavouring to copy the others”(Keynes, 1936 p.214). Attempting to understand the psychological mechanisms behind this behaviour, Tucket (2009) argues that information is processed in different ways in different states of mind. Depending on the mental context, in a “divided” state of mind, agents think about what they know differently: Situations of excitement and euphoria interfere with, and to a certain level replace, calculation and due diligence. Stories about exceptional success catches them and is embraced into their thinking, making them unable to reflect enough or worry about the potential risks in place. As outlined, in the context of euphoria and pessimism in financial markets, people do not think for themselves but engage in the previously described groupthink. The previously mentioned “cover story” in this context was the idea that a new financial architecture had actually changed the nature of risk, that banks don’t need as much equity capital as before and that returns could actually be higher for ever. Most of the involved agents become part of a “basic assumption group”, incapable of questioning if something “fantastic” is actually happening, therefore operating with a divided sense of rationality (Tucket, 2009).

It is oftentimes difficult to distinguish whether a certain “fantastic” outcome is actually true or only a fantasy: Experiments have proven that fantasies can produce electrical and chemical activity in our brain that is almost the same as would occur if they were actually lived (Bechara and Damasio, 2005). It could even be said, that “markets are not well organized to manage the power that financial assets have to generate emotion and their wider effect on human imagination and judgement, anchored in neurobiology”(Tucket, 2009 p.1). The evolvement of bubbles, resulting from the fact that people oftentimes engage in “group think”, instead of thinking for themselves can be explained by peoples (un)confidence in their own capabilities.

3.4.2. Miscalibrated confidence

Whereas traditional financial models of trade assume that agents have confidence reflecting the precision of their information, the empirics have proven that people only rarely show this characteristic: People tend to overestimate their ability to predict certain events when they have little or poor information. Surprisingly, people tend to be under confident in their ability to answer easy questions. Griffin and Tversky (1992) have coined this cognitive psychology phenomenon as the "hard-easy effect". While their research was based on asking people hard and easy questions, financial research on financial markets come to the same conclusions: People are overconfident in their ability to predict hardly predictable markets, which can be shown proven by the excessive trade volume phenomenon (Odean, 1999). In regard to market reactions to information, Daniel, Hirschleifer and Subrahmanyam(1997) have proven that markets underreact to new information due to investors overconfidence in their previous beliefs. Further research by Daniel et al. (1998) has proven that traders overestimate their own ability of collecting precise information. Empirical examples from financial markets such as executives' failure to exercise stock options before expiration, can be seen as overconfidence of people in their own abilities. As a result, investors overreact to private information while underreacting to public information. The previously outlined Post Earnings Announcement Drift paradigm can also be explained from a miscalibrated conference point of view as done by Bloomfild, Libby and Nelson (2003), who show that the PEAD comes from overconfident inferences of old earnings numbers with little information content once new numbers are available (Bloomfield 2006). As we will see in our study of the UAL undervaluation, Investors in other situations prove to be under-confident in their ability to exploit easily detectable arbitrage opportunities, while in turn being overconfident in their ability to predict extremely difficultly predictable scenarios.

The level of confidence of investors in their own ability of determining certain values or outcomes is strongly dependent on which source they obtain their information from. In this sense we will analyse the impact of the media in influencing the perceptions of the masses for one about reality, and also regarding their own abilities.

4. Role of Media in the stock market

The importance of the media in influencing and directing the perceptions, sentiments and expectations of the masses is undeniable, as can be seen by numerous examples in which old information presented by a different source show substantial effects even on stock prices: Huberman and Regev (2001) analyse the case of an article about an old scientific discovery, printed on the front page of the New York Times. This article had an immense impact on the stock price of EntreMed, the company responsible for the discovery, even though the story had occurred and been covered by other journals many months before. Similar mechanisms in which the form of how information is presented impacts stock prices become evident by analysing media coverage regarding United Airlines in September 2008, and certain putatively irrational investors behaviour actually become comprehensible.

Market participants are constantly confronted with an extreme variety of both informative and uninformative news. In this sense, news can be either a piece of information, leading the expectations of investors towards the fundamental value, or solely advice for irrational investors to determine the fundamental value (Corgnet, Kujal, Porter, 2007). In most circumstances, relevant information and noise arise simultaneously and cannot be easily separated, resulting in the noise component affecting agents' investment decisions (Carvalho et al., 2011).

Markets have shown to have unique, oftentimes unexplainable mechanisms in assessing which information (weather informative or uninformative) to pay attention to. The impact of the "guru effect", explaining that markets may be subject to manipulation by influential agents (Sperber, 2005) can be seen in the case of a Speech from Alan Greenspan on Febuary 26th, 2007: After his statement which contained no new information about fundamental values, "When you get this far away from a recession, invariably forces build up for the next recession, and indeed we are beginning to see that sign", worldwide stock markets crashed, illustrating the power of these influential agents (Corgnet, Kujal, Porter, 2007). This simple empirical example shows how prone markets are to individual influence and also manipulation. Experimental studies show that these manipulations have very great influence only in the short-run, leading to the conclusion that markets learn to identify irrelevant information with experience. The effect of a certain information on market variables (Price, Trading volume, Bid-ask spread etc.) depends on its content, reliability and

timing. In this sense, a minimum level of reliability is necessary for a message to be effective. Of course, different subjects assign different levels of liability to different sources, based on past experience. Another necessary condition for the effectiveness of messages is their consistency with the subjects' prior beliefs: Whereas a message can reinforce a subjects previous perception, leading to a reaction, a message that is not consistent with the subjects' previous opinion may be disregarded (Corget et al. 2010).

The "conservatism and representative bias" explaining that new information is underweighted in updating, can also be applied to financial markets: Barberis et al. (1998) show that slow information updating of prior beliefs result in under reaction of prices to new information. In contrast to that, overreaction occurs due to the "representativeness bias", by which traders extrapolate trends in security prices from few observations (Corgnet et al., 2010).

The role of the media in the evolvement of bubbles is extreme: When a certain security or other economical object that is capable of generating excitement becomes focus of attention, the mechanisms leading to bubbles evolve fast: A vicious circle of increased enthusiasm leading to increased demand, leading to increased prices, leading to further enthusiasm and so on can evolve practically out of nowhere. A mechanism of feedback takes place in which narrative rhetoric explaining the situation leads to a generalized belief. A cult of personality regarding the founders of whichever object/security/trend arises due to euphoric media coverage, resulting in an increased pressure for everyone to join the trend. In addition, criticizers of the trend are oftentimes ignored, looked down on, or even dismissed. After an indispensable crash, and in contrasting situations with exorbitant pessimism, the reverse mechanism take place, in which the responsible subjects are blamed or even criminalized (Tucket, 2009). The power, the media has to influence the masses in these situations can be explained by the limited cognitive resources of human beings.

As we suspect the undervaluation of United Airlines in September 2008 to be caused by negative investor sentiment due to excessively negative media coverage, we will analyse in detail the media coverage of this topic in the regarded time period. We suspect the media coverage to have been extremely negative, giving an explanation for how the media was able to bias the investors in their decision-making.

4.1. Limited attention

Because of the fact that people have limited cognitive resources, their attention to (financial) information is determined by how information is presented and how often others talk it about. In this sense, there have been extensive experiments, especially in accounting research, proving that even sophisticated analysts draw their conclusions based on irrelevant aspects of how financial information is presented (Hirst and Hopkins, 1998). Certain features such as the formatting, isolation and ordering of text can alter investor's attention to and weighting of the information (Bloomfield, 2006). Fewer investors examine the footnotes necessary to understand accounting information, and market prices therefore don't completely reveal available information. This "incomplete revelation hypothesis" is of course a contradiction to the EMH, arguing that all available information is incorporated into security prices (Bloomfield, 2002).

Aggregating individual limited attention to collective limited attention of the masses explains how certain securities come in and out of fashion. It also gives an explanation of the home bias puzzle: The puzzle of why investors tend to invest into firms of their region despite the fact that they oftentimes have lower expectations of success, can be partially explained by increased investor attention for local firms due to limited knowledge about other opportunities (Bloomfield, 2006). The phenomenon that firms tend to show increased trading volume when their earnings are growing rapidly, but being ignored when they perform poorly for long periods can also be explained by limited attention. Limited attention can also give an explanation for the fact that firms with low trading volume and strong returns show strong momentum in returns, while those with high trading volume and strong returns show long-term reversal, as argued by Lee and Swaminathan (2000).

In accessing, which information to favour and how to interpret it, several psychological theories and models have outlined the mechanisms of human information processing regarding financial decisions: Research on the Equity premium puzzle has shown that investors take the worst-case approach to new information, resulting in stronger reactions towards bad than to good news. The interpretation is that such behaviour leads to an "ambiguity premium" (Epstein and Schneider, 2008). Further research has shown that ambiguity-averse traders favour information that reduces ambiguity at the cost of undervaluing other valuable pieces

of information (Caskey, 2009). With regards to the undervaluation of United Airlines in September 2008, we would expect the media coverage of this aspect to be insufficient. We would expect the undervaluation to be partially resulting from uninformed investors that don't know that UAL is not bankrupt after all, because the media did not inform them well enough.

These previous sections serve as theoretical base about general behavioural finance, and about how the media contributes towards influencing and manipulating the perceptions and expectations of investors. In order to test the extent to which these theories are relevant in real life financial markets, we will investigate towards the case of the mispricing of the United Airlines stock following the false news release on 08.09.2008. Doing so, we will first analyse the causes of the UAL undervaluation, and then go on to discuss whether the previously outlined theories on human behaviour prove to have been present in this particular example. Here by means of qualitative research we will analyse the extent to which the implications of the previously outlined descriptive theories prove to have influenced the stock price of UAL. We will then expand our research on various other factors, which seem to have influenced the stock price evolvement of UAL stock. Also this will be done by qualitative analysis, taking already existing research to this phenomenon in consideration. As we will see, the implications of some of these theories prove to empirically hold, making this apparent undervaluation explainable, whereas other behavioural forces show to have no relevance. By the help of this case study, we will therefore empirically prove the existence, and verify the relevance of certain behavioural phenomena on real world financial markets. As we suspect negative investor sentiment based on excessively negative media coverage of the issue to be the main cause for the undervaluation, we will investigate towards this phenomenon in more detail, by means of quantitative research: By textually analysing the tone of newspaper articles towards UAL throughout this episode, we intend to quantify the level of negativity in the media throughout the episode, which we assume to have a direct impact on the sentiment on investors.

5. Case Study United Airlines

5.1 Puzzle of UAL Stock Price evolvement

There have been many grave mispricings throughout history such as the obvious overvaluations of tech firms previous to the bust of the “Dotcom Bubble” in 2000, or the “Tulip-mania” in 1637, in which the prices for tulip bulbs rose above more than 10 times the annual income of a skilled craftsman due to speculative investors. This thesis will focus on the undervaluation of the UAL Stock in the period from 09.08.2008 until 09.14.2008, as it is an extremely interesting and recent example, in which the causes and explanations for the phenomenon can be sharply quantified and analysed from a behavioural perspective.

On September 8th of 2008, the republication of a six-year old article about the bankruptcy of United Airlines parent company Henceforth UA resurfaced on the Internet, therefore leading the public to mistakenly believe that UAL was filing for bankruptcy again. Following this false news release, UALs stock dropped 76% in a few minutes, reflecting a total loss in market capitalization of over $1.1 billion. After the news had been identified as false, the price rebounded, yet it ended trading day at 11.2% below the previous day. During this day of extreme price movements, trading volumes skyrocketed.

On September 7th 2008, an article first published on December 10, 2002 by the Chicago Tribune regarding UAL filing for bankruptcy, just like most other American airlines did in that period due to the aftermath of the 9/11 terrorist attacks, was scanned by a Google news engine and added to the Google news pages. The article did not have a standard newspaper article dateline, so it was indexed as being new. On the following morning, an employee from an independent research firm forwarded the article to Bloomberg. Bloomberg went on to releasing the headline “United Airlines: Files for Ch.11, to cut costs by 20 per cent” on its platform at 10:53 a.m. Within 195 seconds, UALs share price fell from $11.85 to $3.00. At 11:06 a.m. UAL released a denial about the false news, and the share price recovered to a price around $9. NASDAQ halted trading at 11:07, and reopened it at 12:30 p.m. Trading day ended with the share being traded at $10.92. The price of UAL share went on to fall even further, to a low of $9.12 on September 11. It took until September 15th for UAL shares to return to pre news release levels. While the sharp price reaction following the first publication of the news can be seen as efficient market behaviour,

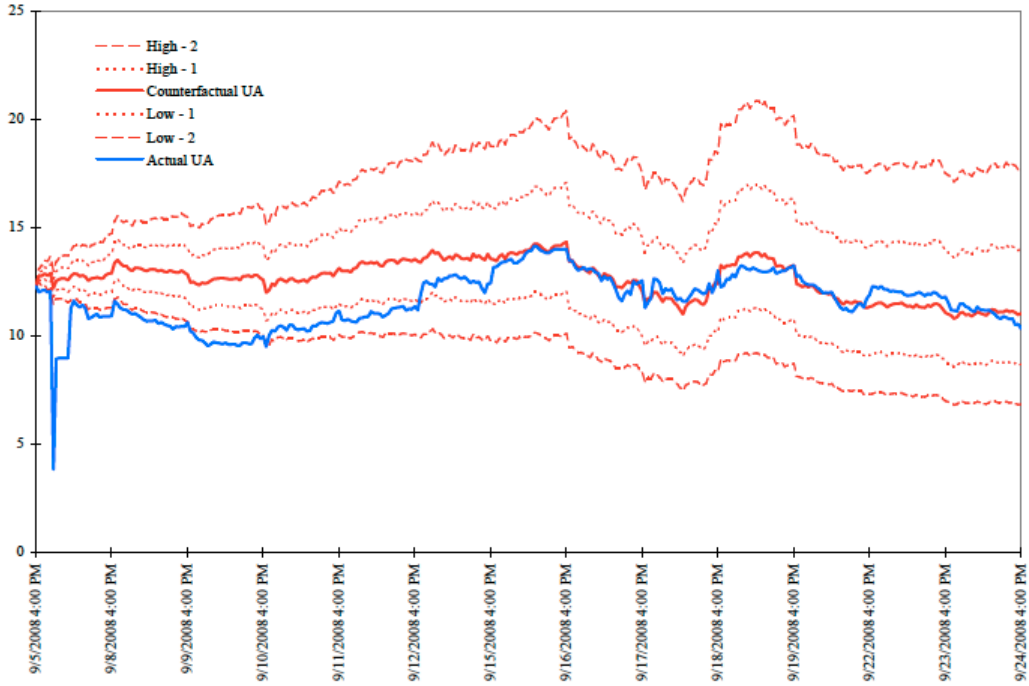
revaluing the UAL stock after new information regarding fundamental value has been released, the failure of the UALs stock price to recover to previous levels after the UAL press release “cancelled the older news out” is rather puzzling and will be investigated in this theses.

In order to examine which path UAL stock would likely have followed, Carvalho et al. (2011) construct a counterfactual path using a simple factor-pricing model for UAL’s stock return. In this sense, the model determines UAL’s (logarithmic) excess stock return (Stock return minus return of risk free rate) to be dependent linearly on the excess return of the market (as proxied by the S&P500 index, noted $r_{M,t}$), the airline industry (as proxied by Bloomberg’s World Airline Index, noted $r_{A,t}$) and the price of crude oil (noted $r_{0,t}$). The factor weights are given by $ß_M$, $ß_A$ and $ß_0$, while c is a constant and e_t an error term explaining the idiosyncratic component of the stock return.

$$r_{UA,t} - r_t = c + ß_M (r_{M,t} - r_t) + ß_A(r_{A,t} - r_t) + ß_0(r_{0,t} - r_t) + e_t$$

By the help of this model, Carvalho et al. constructed a counterfactual path, a path UALs stock would likely have gone in the absence of the false news release, and compare it to the actual path UAL stock went in this episode.

Figure 2: Counterfactual analysis, United Airlines (UA) – Intraday Data



Source: Carvalho et al, 2011

The graph shows that after three trading days, UA shares were still trading below the two-standard-deviation band implied by the model. Only seven days after the false news release, the shares traded essentially at the level predicted by the asset-pricing model.

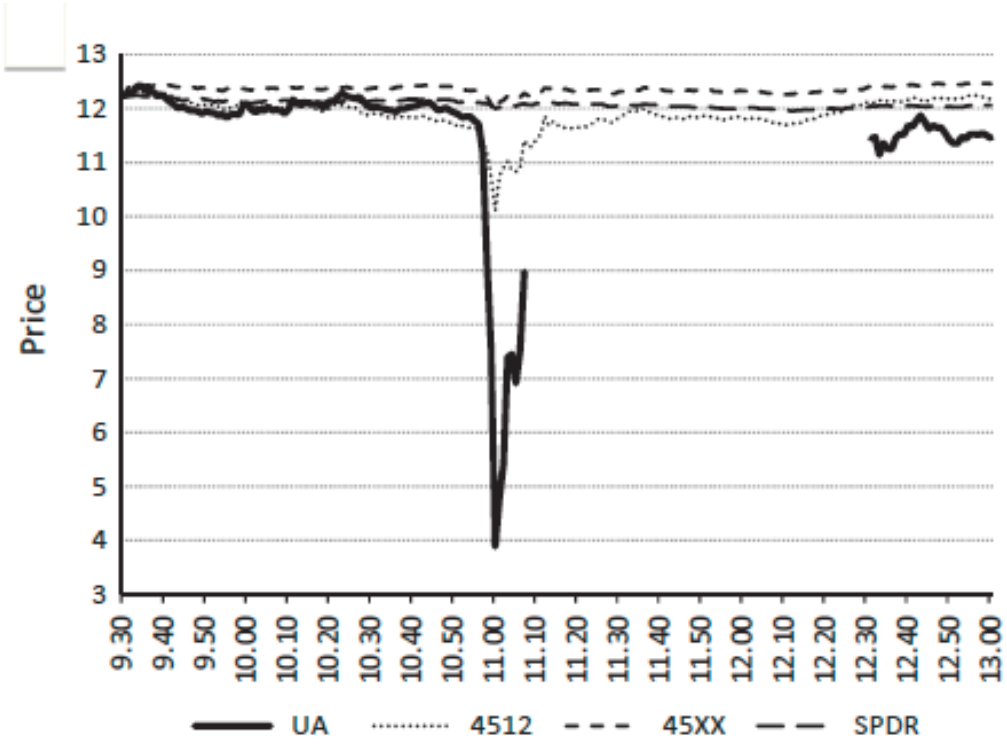
This obvious undervaluation seems unexplainable, especially because it held for a comparably long time period and because it seems to offer an ideal arbitrage opportunity, many rational investors could have taken advantage of.

5.2 Stock Price Evolvement of Competitors and Supplier Firms

It is very interesting to compare the behaviour of the UAL stock to the price path of other American airline stocks and supplier firms: Financial contagion can be regarded as the transmission of financial distress to other related parties. In this particular example related parties could be any entity who's economical success is directly or indirectly dependent on the success of United Airlines such as direct competitors, customers, suppliers but also banks or other stakeholders.

In fact, research from Marshall et al. (2010) shows, that other airlines and suppliers also experienced large price drops following the first news release, but recovered quickly thereafter: By calculating the price effects of not only United Airlines but also on other airlines and United Airlines suppliers, a total of $4.1 billion was wiped out of the market values of these firms after the false news release. By using data for 1-min intervals from the CRSP database, Marshall et al. (2010) analyse the microstructure dynamics such as returns, trading volumes, bid-ask spreads and volatility of all firms in the airline and airline-related industries. In this sense, the return of UAL is compared with the returns of 14 other companies sharing the SIC code of 4512 (Air Transportation Scheduled) and with 17 other companies with the SIC code of 45XX (Air Transportation Scheduled, Air Courier Services, Air Transportation Non-scheduled, Airports, Flying Fields, and Airport Terminal Services) as well as to the SPDR S&P 500 index fund. Subsequent graph shows the graphical analysis of these prices:

Figure 3: UA, Airline Industry and Market Prices on September 8th 2008[1]



Source: Marshall, Visaltanachoti and Cooper (2010)

The graph visualizes how companies in the airline industry were also affected by the UAL false news release. The average loss of firms with SIC code of 4512 was 12% in its low point, the 11 a.m. interval. In contrast to UAL stock, these shares recovered rapidly though when it became clear that the UAL bankruptcy was not true: We can see that both SIC code 4512 and 45XX firms traded even above their opening price levels by 12.54 p.m., only two hours after the false news release.

Analyses of the price path of suppliers of UAL, which name UAL to be an important customer, give similar results. Marshall et al (2010) construct a supplier index, with stock prices of UALs most important suppliers included. As displayed in Appendix 1, UAL suppliers also experienced a sharp decline of 3%, but rebounded quickly once it was clear that the news regarding UAL bankruptcy was false.

5.3 Possible explanations

There have been many situations of apparent over-and under-valuations of securities because of impediments to rational arbitrageurs removing this inefficiency,

[1] Value-weighted indices are created and indexed tot he UA opening price

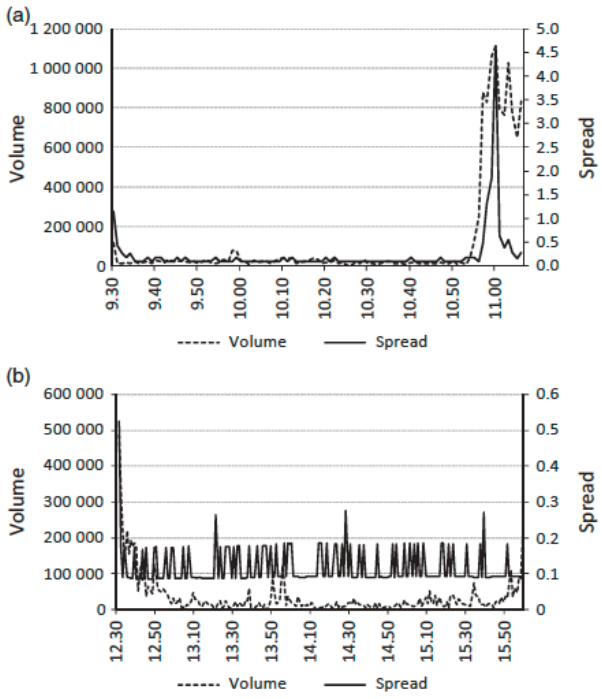
such as short sale restrictions among others. In this UAL setting however, there are no apparent factors preventing prices from returning to normal levels (Marshall et al., 2010). We must therefore search for explanations both by analysing the circumstances of financial markets influencing the United Airlines stock during this episode, and also by discussing the effects of a change in cognition.

5.3.1 Decreased Liquidity and divergent investor opinions

One of the possible explanations not captured in the asset-pricing model are the effects of decreased liquidity in this episode: Investors require a higher return on securities with low liquidity, which explains why they are only willing to pay less for them (Amihud and Mendelson, 1986). The excess returns that traders realized from holding UALs stock during the days of undervaluation could therefore be attributed to be a compensation for decreased liquidity. Periods of low liquidity are characterized by investors increasing their bid-ask spreads to account for the increased risk (Carvalho, Klagge and Moench, 2009). Subsequent graph shows the bid-ask spread of the UAL stock on the day of the false news release.

Figure 4a) UA Bid-Ask Spread and Volume on 8th September 2008 Prior to trading halt[2]

Figure 4b) UA Bid-Ask Spread and Volume in 8th of September 2008 following the halt



Source: Marshall et al. (2010)

[2] End of 1-min interval bid and ask quotes are used for the spread

As the increased bid-ask spread only significantly increased in the short time interval between false news release and trading halt, but returned to normal levels already on the same day and remained normal on the following days, one can exclude decreased liquidity to be the responsible for the undervaluation.

Another good proxy for liquidity in financial markets is trading volume: UAL share actually experienced extreme increases in trading on September 8th, with average trading volume approximately four times higher than those of surrounding days. Increased volume can also be seen as a proxy for divergent investors opinions: The greater the differences in opinion regarding the true value of the stock and its future price, the higher should be the trading volume (Marshall et al 2010). As outlined in previous sections, the presence of noise traders can drive the prices of securities down for a considerable period of time. In such an environment, in which many noise traders sell UAL share, and where this selling pressure is offset by the buying of rational investors who identified the UAL news release as false, an increase in trading volume would be the consequence. Yet, this only occurred on September 8th , but not in the following days, implying that investors' opinions were actually very coherent, in assessing the stock to not be undervalued (Marshall et al., 2010). As these explanations based on market imperfections and decreased liquidity do not hold, we will now focus on explaining the pricing anomaly by investigating towards the general investment environment in September 2008.

5.3.2 Investment Environment in September 2008

One of the most straight forward explanations for this undervaluation comes from the context in which this episode occurred: This UAL episode occurred one week before the bankruptcy of Lehman Brothers, which marks the beginning of the financial crisis leading to a worldwide economic recession. These were special circumstances in the American financial environment, characterized by changes in market perceptions about the health of the U.S. financial sector, due to high borrowing needs in a surrounding of tightening borrowing constraints and lending standards (Carvalho et al., 2011). Yet, by analysing that other airlines rebounded quickly and that the market (S&P 500 index) only experienced low drops (below 1%), one comes to the conclusion that general investor fear regarding the equity market

cannot be responsible for the long lasting undervaluation of UAL stock. In addition, by analysing the CBOE S&P 500 market volatility index, which is commonly referred to as “investor fear gauge”, it becomes clear that the index was at levels similar to the 10-year average in the period of the UAL under-pricing. This seems to exclude the possibility of general investor fear as an explanation for the lasting under-pricing (Marshall et al 2010). As also this explanation fails, we must address ourselves to other alternative explanations, focused more on human cognition and information processing.

5.3.3 Miscalibrated confidence

The concept of miscalibrated confidence outlined in section 2.4, demonstrates that human beings have an extremely puzzling distribution of confidence in their own abilities. As outlined, they oftentimes overestimate their abilities to predict unpredictable outcomes, but in turn oftentimes have extremely weak confidence in their ability to answer very easy questions. Even though the degree of self-confidence of investors during the UAL episode to define the true value of UAL stock is not measureable years afterwards, we will go as far as stating that investors must have excessively underrated their own ability to determine the fundamental value of UAL. Any first year finance student would be able to tell that the failure of UAL stock price to return to previous levels represents a clear arbitrage opportunity. Even though many investors surely realized this, the failure of the stock price to return to previous levels and the lacking increase in trading volume in the subsequent days shows that these same investors obviously did not have confidence in their ability to spot a so obviously under-priced security. This failure of investors to think for themselves becomes explainable with the knowledge of groupthink mechanisms, in which individuals fail to question the overall generalized belief. Here the media contributes to the masses perceptions about the health of United Airlines by negative reporting. As a result, individuals do not have enough confidence in their ability to spot the arbitrage opportunity. Yet, this lack in confidence is not measurable now because of the time lag between the mispricing episode and this research, and could also be attributed to investors’ ambiguity aversion. We will therefore go as far as stating that miscalibrated confidence is a strong factor contributing to the undervaluation of UAL stock, without being able to prove it. We therefore propose

further research to be done on miscalibrated confidence in respect to financial markets to be done. Here qualitative interviews of leading fund managers and other investors at the exact moment of certain market anomalies could make the concept of miscalibrated confidence and the implications it has on certain concrete cases more quantifiable.

5.3.4 Ambiguity aversion

The idea of ambiguity aversion regarding financial markets builds up on Epstein and Schneider's (2008) model, stating that investors take a worst-case assessment of the quality or precision of news, when they face news of uncertain quality. In a situation characterized by investors having to rely on news of uncertain or bad quality, the negative impact on prices can be significant. The rational is that uncertainty-averse investors require a premium for holding such an asset, leading to decreased prices. In this sense they also react more strongly to bad than to good news. Investigating the UAL episode, we can conclude that the false news release, followed by a revision, is a clear deterioration in the information quality regarding United Airlines. The following undervaluation of UAL stock can therefore be seen as inevitable market reaction to the uncertainty of news quality. Because of this uncertainty, traders are concerned that they might be trading with better-informed investors. As a result they increase their Bid-Ask spreads in the period of highest uncertainty (Luini, 2012).

As we have seen in the graph above, the increase in spread is only of extremely short duration, as the bid-ask spreads returned to normal levels already shortly after the trading halt. Ambiguity aversion can therefore explain the short-term undervaluation of the stock, yet does not give us an explanation how this undervaluation could last for so long. Because also this market based explanation, as a result of rational investors assessing the risk of a stock, proves to not give a justification for the (long-term) undervaluation of the stock, we will now go on to analysing explanations from a rather cognitive approach, taking humans bounded rationality into consideration.

5.3.5 Emotional Relationships

It has been proven that investors create mental relationships to stocks. It is very common to hear traders, brokers or other investors say phrases such as “I love this stock” or “This security drives me crazy”. When investors commit to an investment strategy, they implicitly commit to an imagined relationship in which gains and losses generate feelings such as pleasure and pain. In this sense, psychologists postulate imagined emotional relationships as governed by loving, hating and knowing or anti-knowing. In the case of a bubble or a crash, an investor is prone to love or hate a certain stock, but unlikely to “know” in the sense that the reality is appreciated and valued for itself.

Investors in a “divided” state of mind split opposed, conflicted, or ambivalent perceptions towards people, objects or even stocks into entirely separate, and oftentimes exaggerated, feelings of love or hate. Investors in such a divided state of mind are oftentimes not aware of the true reality (Tucket, 2009). It is very likely that investors during the crash of UAL stock lived through exactly this process. The previously positive feelings that they had towards the stock are replaced by pure hate after it crashes. Investors have maintained this state of mind even after the news was declared as false and the stock price partially recovered, because of unconscious mental work which psychoanalysts call “splitting”: In this sense, reality (that UAL is not bankrupt after all) is split from phantasy and feelings such as anxiety, and unexplained jitters or dread (towards UAL stock) can be felt for longer periods of time. Only after a certain time, when available information can no longer be “split off”, it becomes integrated. Even though the effects of this phenomenon are not quantifiable, the slow, delayed revision of UAL stock price to fundamental value becomes comprehensible by the implications that emotional relationships have on the actions of diverse investors. We now focus on more quantifiable measures, capable of giving more detailed explanations for the UAL undervaluation.

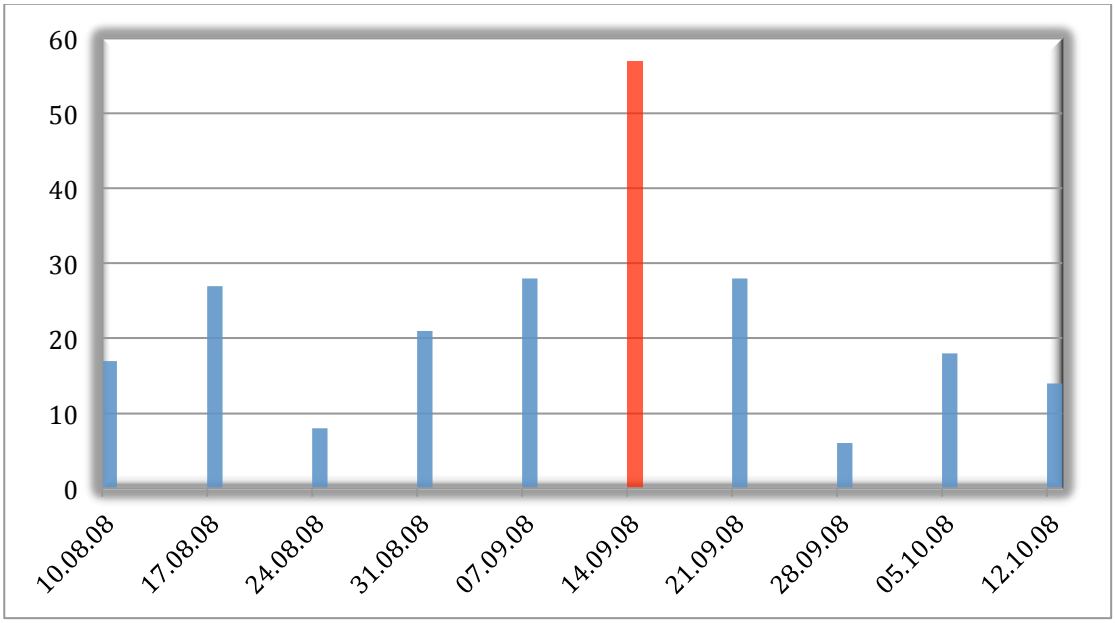
5.3.6 Limited public attention

The previous sequences have already outlined the importance and significance of the media in transmitting information to the markets and in affecting how market participants perceive the world. It is oftentimes argued that the failure of

UAL's stock to return to normal levels, as well as other situations of strong mispricings throughout history to be caused by limited information due to poor media coverage of the issue. Yet, attributing the failure of UAL stock to return to pre-news event levels to insufficient information provided to investors by the media is certainly wrong.

In order to prove this, we have analysed the media coverage about United Airlines during the episode. In order to estimate whether the news agencies were covering the story sufficiently, we have analysed the extent of media coverage during the episode. We have manually counted the number of articles released in the Bloomberg Terminal about United Airlines in the period surrounding the mispricing episode (35 Days before and after false news release). Doing, so we set the Bloomberg News filters to Company news: United Airlines, Bloomberg & Editorially suggested, Relevence: High, Language: English.

Figure 5: Number of weekly Bloomberg News releases regarding United Airlines



Source: Bloomberg. Manual count

The graph above clearly illustrates the excessive media coverage during the episode. While the average daily media coverage in this 10-week interval before and after the under-pricing was only 2,61 news releases per day, it shows to be 8,14 daily news releases in the period of the under-pricing. We see a total of 57 news releases regarding United Airlines in the week of the under-pricing, opposed to considerably

lower numbers in the weeks surrounding this under-pricing. This statistically significant difference stating that the media covered the news episode excessively, confirms that investors were in fact significantly informed.

Whereas limited public attention as well as decreased liquidity and a changing investment environment in September 2008 were proven not to be accountable for the lasting undervaluation of the UAL stock, the theories of miscalibrated confidence, ambiguity aversion and emotional relationships certainly provided explanations for this lasting phenomenon. Yet, these explanations are not well quantifiable and do not completely satisfy our search for the cause of the undervaluation. As previously stated, the intuitively most appealing explanation is excessively negative investor sentiment and will therefore be analysed in more depth.

5.4 Negative Investor Sentiment

Throughout this paper the concept of affectivity as well as the implications that excessively negative investors can have on the prices of securities, were explained. We will now go on by analysing to which extent excessively negative media coverage leading to negative investor sentiment has actually been present in this episode. While most of financial research takes reception and transmission of news as given, this paper aims to estimate the impact of news on asset prices by analysing the linguistic of newspaper articles. We will use textual analysis in an attempt to convert qualitative information from news stories into a quantifiable measure by analysing the positive or negative tone of the information.

Sentiment analysis can be defined as “the process of determining whether a piece of writing is positive, negative or neutral. It is also known as opinion mining, deriving the opinion or attitude of a speaker” (Lexalytics.com, 2016). Doing so, we build up on previous research, such as by Tetlock (2007), who created a media-based measure of sentiment by linguistically analysing the Wall Street Journal column “Abreast of the Market”. Tetlock uses the General Inquirer, a textual analysis program, alongside the Harvard-IV-4 dictionary to calculate the fraction of negative words. In this sense, he finds that high levels of negative sentiment predict low returns for the Dow-Jones index over a few days, followed by a reversion. Additionally he finds, that high trading volumes follow unusually high or low levels of pessimism. Regarding timing, Tetlock, Saar-Tsechansky and Mackassy (2008) find

that stock prices respond with a one-day delay to negative language in firm-related news. Similar research, such as done by Sinha (2009) who uses a sentiment score from Thomson-Reuter to measure the tone of news articles and constructs portfolios based on past sentiment, shows that a portfolio long in positive and short in negative-sentiment firms is able to generate abnormal positive returns.

In order to explain the impact that newspaper articles had on the affect of investors, we analyse the sentiment in newspaper articles regarding both United Airlines and the airline industry in general in the respected time period.

Data collection

After careful consideration, it was decided to choose the Bloomberg LT as the most appropriate source. The Bloomberg Terminal is an integral piece of software to access financial information. The software currently holds over 325,000 subscriptions worldwide, and can be seen as the leading news provider for traders, portfolio managers, and risk management analysts as well as other financial professionals. In order to get a statistically meaningful probe, we have analysed the sentiment of 74 bloomberg articles on United Airlines. Because Bloomberg news only supplies 50 articles on a certain filtering, we chose to analyse the 15 top ranked articles on September 8th and 9th as well as the 50 top ranked articles on United Airlines from the period September 10th to September 14th of 2008. Because some of these articles were links to other sources, which did not have these historic articles in the database anymore, we ended up with a total of 74 articles to analyse. In order to get the most relevant, and yet a sufficient number of articles we set the filters to Source: Bloomberg&Editorally Suggested; Relevance: Medium; Language: English. These articles were then ranked to Top Rated. In order to get a statistically significant approximation of news sentiment regarding the airline industry, we pursued the same course of action: Again we analysed the 15 top rated articles from the period of 8th and 9th of September 2008, and then the 50 top rated articles from the period of September 10th to 14th of 2008. Here the filters were set as follows: Region: United States; Industry: Airlines, Air Transport Services ;Language: English; Source: Bloomberg & Editorally Suggested; Relevance: Medium. As this research provided us with 76 articles, we excluded the 2 lowest rated articles in order to get an equal number of inputs. These articles were than formatted in order to fit the Semantria Sentiment analysis program. These formattings included only selecting the text

(excluding all tables, pictures and videos from the source) and in few situations shortening the input text in order to satisfy the Semantria Program requirements.

Software

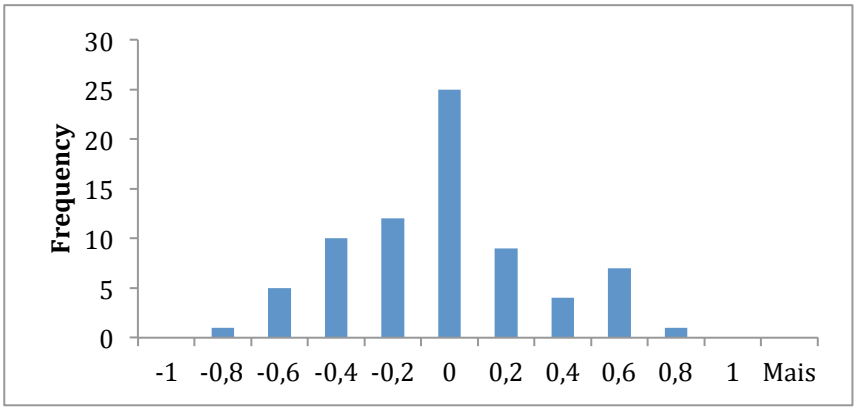
In order to analyse the previously collected articles, we decided to use the Semantria Lexalytics ® sentiment analysis program. The Lexalytics explanation of how the software does sentiment analysis are extracted from the companies Whitepaper of 2015 and displayed in the following paragraph:

"Sentiment scoring allows a computer to consistently rate the positive or negative assertions that are associated with a document or entity"... "Once you have reliable, consistent machine-based sentiment scoring, there are a number of applications that become feasible inside of financial services (automated trading, better information to traders), reputation management (the problem every marketing person faces), "voice of customer" (listen to how they're saying what they say, don't constrain them to closed-ended questions), eDiscovery (was there a wave of negative emails before a certain crisis hit?), etc..."..." Our software identifies the emotive phrases within a document and then scores these phrases (roughly - 1 to +1) and then combines them to discern the overall sentiment of the sentence"

Findings

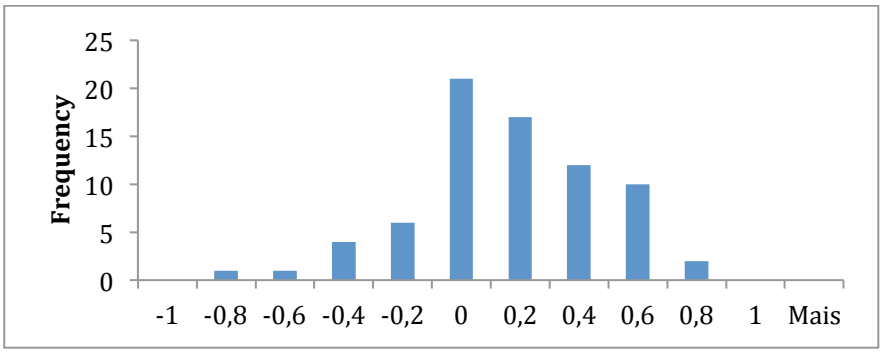
The detailed output of the sentiment Analysis of each article can be found in Appendix 2 and Appendix 3. As the software assigns a sentiment score from -1 to +1 to a certain article, the subsequent graph shows a graphical representation of the distribution of the sentiment scores of all articles regarding United Airlines.

Figure 6: News sentiment score distribution regarding United Airlines



Comparing this with the subsequent sentiment distribution of all articles relating the Airline Industry, we can already see that the sentiment regarding United Airlines in the analysed time period was significantly lower:

Figure 7: News sentiment score distribution regarding Airline Industry



Because the analysed time frame is too short to do a regression estimating the impact that the news sentiment had on the price evolvement of the UAL stock and the airline industry, we can only compare the level of negative sentiment of articles regarding United Airlines with articles regarding the airline Industry. In order to do so, we construct a Student`s t-test, which is a statistical hypothesis test in which the test statistic follows a Student`s t-distribution under the null hypothesis. By setting the null hypothesis to “difference between averages equals zero”, we can determine weather our two data sets have a statistically different average sentiment. The subsequent graph delivers the results of our test:

Table 1: Student`s t-test regarding average News Sentiment United Airlines, Airline Industry

Investor Sentiment Scores	*United Airlines*	*Airline Industry*
Average	-0,11806552	0,06922178
Varience	0,116199708	0,106402321
Observations	74	74
Pearsons Correlation	-0,000800138	
Hypothesis in difference of averages	0	
gl	73	
T Stat	-3,413391642	
P(T<=t) uni-caudal	0,000525074	
t critical uni-caudal	1,665996224	
P(T<=t) bi-caudal	0,001050148	
t critical bi-caudal	1,992997126	

As we can see, this empirical analysis confirms what we have already suspected: The average sentiment towards United Airlines was very negative with a score of -0.12, while the average sentiment towards the Airline Industry was neutral, with a score of 0.07. In addition, the results are statistically significant in the sense that we can neglect our null Hypothesis, that the average sentiment of both data series is the same, at a 1% level, as seen by the P(T<=t) bi-critical value of 0.00105.

Interpretation

These findings are coherent with our previous research on negative affectivity. Our research proves that throughout the whole mispricing episode, the media coverage regarding United Airlines was excessively negative. Even though it is impossible to prove the impact that negative media coverage has on the sentiment of investors, we interpret these findings in the manner that because of the excessively negative news coverage towards United Airlines, negative emotions were generated towards United Airlines. These negative emotions are associated with impaired cognitive capacity for information processing (Watson and Tellegen, 1985). It is therefore probable that investors experienced subjective distress resulting in feelings such as sadness, guilt or nervousness, distorting their capability of rational decision-making. These mechanisms ultimately lead to the irrational, excessively negative perception of true value, resulting in a severe undervaluation of the United Airlines stock. In line with van Knippenberg's (2008) research, it seems that investors have taken on a preference driven (rather than evidence-driven) processing style, diminishing the rational processing capacity of the brain. Our findings also confirm Williams, Zainubas and Jacksons research (2003), stating that negative affect leads to stronger risk avoidance: Even though a rational investor sees that the undervaluation offers a remarkable arbitrage opportunity with the expected gains exceeding the implied risks by far, our research shows that investors were not willing to take these risks. Our research towards negative investor sentiment has now given us a quantifiable empirical explanation for the strong undervaluation of UAL stock.

6. Conclusion

This previous research analysed the extent of irrational human behaviour in the financial world, and the implications that these behaviours have on prices in

financial markets as a whole. In order to find an explanation for the puzzling undervaluation of the United Airline Stock in September of 2008, we have conducted an extensive literature research in an attempt to find explanations for this puzzle, and to discover mechanisms leading to these market anomalies.

Doing so we have built up on previous research on economic theory, cognition, group decision making, and media power. We have served ourselves from previous research on these fields, analysed models about group decision-making such as from Janis (1972) and applied this research to financial markets. Throughout this process, the limitations of humans in their rationality and in their decision-making as described by Hirst and Hopkins (1998) quickly became focus of attention as it turned out to explain certain behavioural paradigms, also in the financial world. Yet, we have seen no signs within our study of the media coverage towards UAL in September 2008, which leads us to believe that the mispricing was attributed to limited attention.

Here we have seen the immense impact that the surrounding has on how individuals perceive reality. Whereas traditional behavioural literature describe the unquestioned general believes in a rather descriptive fashion, we empirically analysed the effects of an unquestioned generalized belief, and how the media contributes to the establishment of this, on the financial markets.

Doing so, we conducted an in-depth analysis of the United Airlines undervaluation puzzle from September 2008. Here we were able to attain interesting results, contributing to already existing behavioural and financial research to this topic: By analysing the stock price evolvement of United Airlines competitor and supplier firms, we realized that the United Airlines stock valuation did not have any contagion effects on these, leading us to the conclusion that the under-pricing must be attributed to a changing perception of value only towards United Airlines, not of the Industry. In order to prove this, we have first eliminated decreased liquidity, ambiguity aversion and the effects of a changing investment environment prior to the financial crisis of 2008 as possible causes by analysing for trading volumes, spreads, market returns and the “investor fear gague”. As expected, these market-oriented explanations have failed to explain the mispricing of UAL stock.

In the second part of our case study, we built our research up on previous general behavioural finance literature, and empirically examined the effects that emotional relationships, limited public attention and especially negative investor sentiment have on financial markets in the specific case of the UAL stock

undervaluation. Doing so, we have outlined the impact that emotions can have on stock price evolvement. As our previous research showed the significance and influence the media has in public opinion forming, we analysed the effects of the media in influencing the public opinion. By the help of quantitative analysis we have proven that the media sufficiently covered the mentioned episode, excluding limited public attention as a possible explanation to the under-valuation.

Our main contribution to existing research in behavioural finance literature lies in the sentiment analysis of media coverage throughout the mispricing episode. To our knowledge there has not been any study of news sentiment regarding the UAL undervaluation in September 2008. Here we have built up on research by Tetlock (2007) and were able to empirically display the impact that excessively negative media coverage has not only in influencing perceptions and expectations of investors, but also which outcomes this can have on prices in financial markets. Besides the interesting findings for academic research, this thesis gives implications useful for professional fund managers and other investors, who can benefit from these findings by adjusting their trading strategy to account for the effects of negative news coverage on investor sentiment.

Despite these extremely interesting findings, there is further research to be done in the area of behavioural finance, especially in regard to analysing the effects that (negative) investor sentiment has on stock prices. We have assumed that excessively negative media coverage leads directly to negative investor sentiment. This needs to be examined in more detail by means of qualitative research, of how strongly financial media actually influences the perceptions of agents. Here immediate qualitative interviews of key market participants in periods of mispricing could be an adequate form of measuring the level of negativity in the exact moment.

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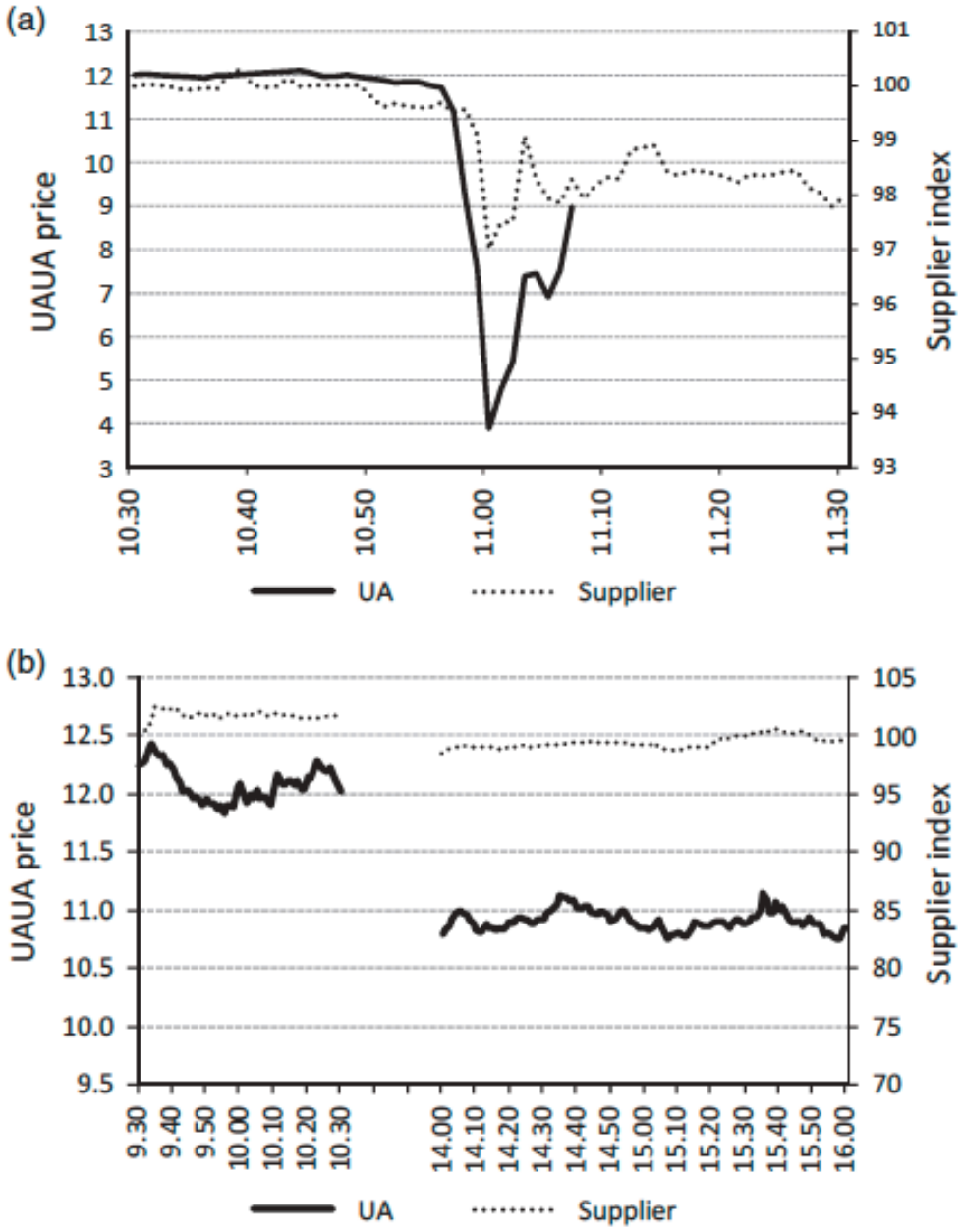
- http://prospect-theory.behaviouralfinance.net/
  (accessed on December 12th, 2015)
- https://www.lexalytics.com/technology/sentiment
  (accessed on January 14th, 2016)

Appendix 1: UA and UA Supplier Prices on September 8th 2008 (a) around trading halt and (b) throughout the day



Source: Marshall et al. (2010)

Appendix 2: Extract of Input for Sentiment Analysis (United Airlines

Date	Headline	Source Text	Document Sentiment	Document Sentiment +/-
09.08.08 11:00	UAL Corp-UAUA shares drop over 60%, no news yet	UAL Corp-UAUA shares drop over 60%, no news yet	-0,54	negative
09.08.08 11:02	UAUA: UAL Corp: United Airlines files for Ch. 11 to cut	UAUA: UAL Corp: United Airlines files for Ch. 11 to cut	-0,15	negative
09.08.08 11:03	UAL Corp-UAUA shares fall following headline of Chapt	UAL Corp. shares have dropped after a headline crossed	-0,15	negative
09.08.08 11:08	UAL Corp-UAUA spokeswoman says company has not f	UAL Corp-UAUA spokeswoman says company has not	0	neutral
09.08.08 11:11	UAL Corp-UAUA volatility spikes above 200 on panic sel	UAUA halted down $3.30 to $9. UAUA September option	-0,6	negative
09.08.08 11:13	UAL Corp-UAUA says no truth to bankruptcy news, Dav	UAL Corp-UAUA says no truth to bankruptcy news, David	-0,2340368	negative
09.08.08 11:25	++ UAUA: UAL Corp: CNBC commentator says a story o	UAUA: UAL Corp: CNBC commentator says a story on	-0,9882635	negative
09.08.08 11:49	Continental Airlines to Launch New Nonstop Service Be	Continental Airlines (NYSE: CAL) today announced new	0,4695745	positive
09.08.08 12:04	United Air Parent UAL Says It Didn't File for Bankruptcy	United Air Parent UAL Says It Didn't File for Bankruptcy	0	neutral
09.08.08 12:13	UAL Corp-UAUA says reports that company filed for ba	United Airlines said reports that the company filed for	-0,2712707	negative
09.08.08 12:14	UAUA: UAL Corp. says reports that it filed for bankrupt	Co says that reports that it filed for bankruptcy are	-0,7294211	negative
09.08.08 12:25	UAL Corp-UAUA to resume trading at 12:30 PM EDT	Quotation will resume at 12:25 PM EDT.	0	neutral
09.08.08 13:10	CHICAGO TRIBUNE SAYS STORY ON UNITED AIRLINES IS	(The following is a reformatted version of a press release	0,4095531	positive
09.08.08 16:34	UAL Plummeted 76% After Incorrect Bankruptcy Report	United Airlines parent UAL Corp. lost as much as 76	-0,2341121	negative
09.08.08 17:35	United Parent UAL Says It Didn't File for Bankruptcy (Up	United Parent UAL Says It Didn't File for Bankruptcy	0	neutral
09.08.08 17:42	Tribune Statement on Archived Story on United Airlines	Tribune Company today issued the following statement	-0,1359222	negative
09.09.08 01:00	A Mistaken News Report Hurts United	How jittery are investors about airline stocks these days?	-0,442259	negative
09.09.08 02:03	Miami Herald: How an online time warp blindsided Uni	United Airlines and its stockholders experienced the	-0,2662326	negative
09.09.08 06:51	Sept. 11 Memorial Dedicated At Boston Airport	A $3.5 million memorial honoring those who died when	-0,242	negative
09.09.08 08:00	Internet-fueled panic rocks United Airlines' stock	A nearly six-year-old article circulating on the Internet as	-0,3451769	negative
09.09.08 08:02	Continental Airlines to Launch Third Daily New York-He	Continental Airlines (NYSE: CAL) today announced that it	0,0298827	neutral
09.09.08 08:13	Yesterday's UAL market debacle--was Google at fault?	UAL Corp. (UAUA) saw its shares plunge 75% on the	-0,6587148	negative
09.09.08 08:39	CapitalSource, Cardica, Dell, Delta, UAL: U.S. Equity Pre	The following companies may have usual price changes	0,0606228	neutral
09.09.08 09:38	CapitalSource, Cardica, Delta, US Airways: U.S. Equity M	The following companies are having unusual price	0,1695714	neutral
09.09.08 09:55	Continental Air to Drop Year-Round Flights at London's	Continental Airlines Inc., the U.S. carrier most dependent	0,3801043	positive
09.09.08 15:54	Continental to Lay Off 148 Pilots; 326 Jobs Saved, Unior	Continental Airlines Inc. is laying off 148 pilots starting	0,4762311	positive
09.09.08 17:12	Continental to Trim Pilot Ranks by 7.3%, Union Says (Up	Continental Airlines Inc., reducing its workforce to help	-0,0672399	negative
09.09.08 17:43	UAL Story Revived By Clicks On Paper's Web Site	The outdated bankruptcy story that sparked a run on	-0,5117528	negative
09.09.08 18:12	Tribune Says Old United Airlines Story Appeared on We	Tribune Co. said a 6-year-old article on United Airlines'	-0,7032858	negative
09.09.08 18:21	Tribune Findings on United Airlines Story From Decemb	Based on our examination of the data up to this point,	0,260779	positive
09.09.08 19:33	Tribune Says Link to Old United Story Was on Web Site	Tribune Co. said a link to the 6-year-old article on UAL	-0,5967194	negative
09.09.08 21:21	Jim Cramer's "Mad Money"	Cramer said its time to speak out about Lehman	-0,1850164	negative
09.10.08 06:01	Jim Cramer's "Mad Money"	Cramer said its time to speak out about Lehman	-0,1850164	negative
09.10.08 07:50	Airlines suffer from high anxiety-WSJ	Turbulence will define the airline industry for some time	-0,29	negative
09.10.08 08:00	Google, Tribune Co. at odds over spread of United story	A day after the recirculation online of an old newspaper	-0,5232259	negative
09.10.08 10:39	EU May Tighten Airline CO2 Cap to Loosen Curb on Mar	The European Union should tighten a future cap on	-0,1051553	negative
09.10.08 11:55	Continental Airlines Named to Latin Business Magazine	Continental Airlines (NYSE: CAL) is one of 13 companies	0,535644	positive
09.10.08 12:10	U.S. FAA Should Audit Airline Safety Disclosures, Panel	U.S. aviation regulators should audit airlines' voluntary	-0,1535682	negative
09.10.08 15:15	U.S. Stock Options With Biggest Changes in Implied Vol	The following are the U.S. stock options that had the	-0,11	negative
09.10.08 15:53	FAA Should Audit Air Safety Disclosures, Panel Says (Up	U.S. aviation regulators should audit airlines' voluntary	-0,1535682	negative
09.10.08 16:28	Biggest NYSE Changes in Short Interest vs Float as of Au	The following tables show companies listed on the New	-0,1962521	negative
09.10.08 16:42	UAL Corporation to Present at the Calyon Airline Confe	UAL Corporation (Nasdaq: UAUA) announced today that	0,114682	neutral
09.10.08 18:47	Tribune Says Confusion Over 2002 Article Started With	Tribune Company today said the confusion surrounding a	-0,484796	negative
09.10.08 18:55	Tribune Says Confusion Over United Story Started With	Tribune Co. said the confusion over a 2002 article on	-0,3802516	negative
09.10.08 20:54	Tribune Says Confusion Over UAL Started With Google	Tribune Co. said the confusion over a 2002 article on UAL	-0,0379621	neutral
09.10.08 23:39	Flight 93 memorial helps people to 'never forget'	In a nation sworn to "never forget" the worst acts of	-0,2305255	negative
09.11.08 00:00	UAL Stock Crashes	File under "Don't Believe Everything You Read on the	-0,4076799	negative
09.11.08 06:52	McCain And Obama Commemorate 9/11 Anniversary	Republican presidential hopeful John McCain asked	0,0397204	neutral
09.11.08 06:56	Continental-CAL targeted cash,cash equivalents and sh	Continental anticipates ending Q3 of 2008 with an	0,0299507	neutral
09.11.08 08:00	McCain, Rendell remember victims at Flight 93 crash sit	A brisk breeze blew this morning the field where	-0,646	negative
09.11.08 09:56	Venezuela to Reduce Flights by U.S. Airlines, Universal	Venezuela plans to reduce the number of flights offered	0,15	neutral
09.11.08 10:35	Continental Airlines Posts Gain in Domestic Bookings (U	Continental Airlines Inc. said bookings for domestic	-0,0367442	neutral
09.11.08 12:03	Continental Airlines Prepares for Hurricane Ike	Customers traveling to impacted cities may reschedule	-0,5307726	negative
09.11.08 12:25	Google Says Tribune Didn't Ask It to Stop Searching We	Google Inc. said it wasn't asked by Tribune Co. to stop	-0,114248	negative
09.11.08 12:39	Today On The Presidential Campaign Trail	On 9/11 anniversary, McCain and Obama ask citizens to	0,44303	positive
09.11.08 14:42	Continental Airlines, Diebold, Whole Foods: U.S. Equity	The following companies are having unusual price	0,459944	positive
09.11.08 15:11	American, Continental, Southwest Cut Texas Flights as I	AMR Corp.'s American Airlines, Continental Airlines Inc.	0,1527045	neutral
09.11.08 15:18	Continental Airlines to Reduce Houston Hub Flights Due	continental.com provides latest flight information and	-0,3104	negative
09.11.08 15:46	UAUA: UAL Corp: SEC opens early inquiry into UAL stoc	UAUA: UAL Corp: SEC opens early inquiry into UAL stock	0	neutral
09.11.08 16:13	Venezuela Notifies U.S. Airlines of Coming Flight Reduc	American Airlines, Delta Air Lines Inc. and Continental	0,5	positive
09.11.08 17:03	SEC Probing Circumstances Around UAL Stock Drop, WS	The U.S. Securities and Exchange Commission is probing	-0,2246067	negative
09.11.08 17:07	Allergan, CSX, Lehman, Sotheby's, Sunoco: U.S. Equity M	The following companies had unusual price changes in	0,2810522	positive
09.11.08 17:13	AMR, Continental, Southwest Cut Flights as Ike Nears (U	American Airlines, Continental Airlines Inc. and	-0,0959047	negative
09.11.08 17:13	Continental Airlines Presenting at the Calyon Airline Co	Continental Airlines (NYSE: CAL) will be presenting at the	0	neutral
09.11.08 23:01	FAA Urged to Produce New Rest Rules for Pilots, WSJ R	Pilots and safety experts are increasing pressure on the	-0,0645341	negative
09.12.08 01:13	Orlando Sentinel: Memories of 9-11 are set in stone at	The three pieces of stone -- 5-inch chunks, arranged in a	-0,5913346	negative
09.12.08 09:08	SEC investigates UAL Corp.'s stock drop-WSJ [MORE]	"Anytime anyone spreads false information over radio,	-0,0206416	neutral
09.12.08 14:58	Continental Airlines Suspends Houston Flights Sunday;	Continental Airlines (NYSE: CAL) has suspended	-0,455177	negative
09.12.08 21:32	Airline operates hubs from bunker: Staff waits out storr	Continental Airlines, which still has an international	-0,1416238	negative
09/13/2008 13:3	Continental Airlines Assessing Impact of Hurricane Ike	Continental Airlines (NYSE: CAL) is currently assessing	-0,2181249	negative
09/13/2008 14:2	United Airlines Offers Advice to our Customers Affected	For the safety and comfort of our customers during the	0,1935971	neutral
09/14/2008 01:0	OP-ED CONTRIBUTORS; Real Heroes, Fake Stories	IT is one of the most stirring accounts of heroism to	-0,0894347	negative
09/14/2008 19:5	Continental Airlines to Resume Flights Monday at Hous	Continental Airlines (NYSE: CAL) is preparing to resume	0,6	positive
09/14/2008 21:1	Continental-CAL announces Jeff Smisek elected preside	At Continental's regularly scheduled board of directors	0,3554798	positive

Appendix 3: Extract of Input for Sentiment Analysis (Airline Industry)

Date	Headline	Source Text	Document Sentiment	Document Sentiment +/-
09.08.08 02:12	Air France-KLM August Traffic Rises 2.8% on A	Air France-KLM Group, Europe's biggest airline, said	0,064178	neutral
09.08.08 02:34	KLM's Martinair Approval May Take Until 2009	Air France-KLM Group may not win regulatory approval to	-0,2538954	negative
09.08.08 02:43	China Eastern Considering Merger With Shang	China Eastern Airlines Corp., the nation's third-largest	0,4298687	positive
09.08.08 02:56	Air France-KLM August Traffic Rises 2.8% on A	Air France-KLM Group, Europe's biggest airline, said	-0,0954543	negative
09.08.08 03:41	Emirates Suspends Airbus A380 Use, Citing Ele	Emirates suspended use of the Airbus SAS A380 airliner on	-0,0904539	negative
09.08.08 05:28	Singapore Air to Cut Fuel Surcharges After Oil	Singapore Airlines Ltd., Asia's most profitable carrier, said it	0,70999998	positive
09.08.08 05:53	Singapore Air to Cut Levy After Oil Prices Decli	Singapore Airlines Ltd., the world's largest airline by market	0,10117367	neutral
09.08.08 09:03	Worldwide Aug. Long-Term Commercial Aircra	Aircraft held in storage globally fell in Aug. to 795 jets, from	0,123886	neutral
09.08.08 10:07	Asur Says August Traffic Rose 13% on Internati	Grupo Aeroportuario del Sureste, Mexico's second-largest	0,40437299	positive
09.08.08 11:02	UAUA: UAL Corp: United Airlines files for Ch. 1	UAUA: UAL Corp: United Airlines files for Ch. 11 to cut costs	-0,15	negative
09.08.08 11:25	++ UAUA: UAL Corp: CNBC commentator says	UAUA: UAL Corp: CNBC commentator says a story on	-0,9882635	negative
09.08.08 11:46	U.S. Stock Options With Biggest Changes in Im	The following are the U.S. stock options that had the biggest	-0,11	negative
09.08.08 12:04	United Air Parent UAL Says It Didn't File for Ba	United Air Parent UAL Says It Didn't File for Bankruptcy	0	neutral
09.08.08 12:38	United Parent UAL Says It Didn't File for Bankr	United Airlines parent UAL Corp. said it didn't file for	-0,111995	negative
09.08.08 16:34	UAL Plummeted 76% After Incorrect Bankrupt	United Airlines parent UAL Corp. lost as much as 76 percent	-0,2341121	negative
09.09.08 02:28	Alaska Air to Install Honeywell Ground Alert Sy	Alaska Airlines Inc. will probably announce today that it's	0,51999998	positive
09.09.08 06:00	Fraport Officially Commences Operations at Cl	Fraport AG's executive board chairman Dr. Wilhelm Bender	0,38838473	positive
09.09.08 07:45	Alaska Air to Install Runway-Collision Alert Sys	Alaska Airlines said it will equip its entire fleet with a crash-	0,55341804	positive
09.09.08 08:28	Air Canada to Introduce Internet Service on Fli	Air Canada, the country's largest carrier, will introduce	0,187874	neutral
09.09.08 08:39	CapitalSource, Cardica, Dell, Delta, UAL: U.S. E	The following companies may have usual price changes in	0,06062277	neutral
09.09.08 09:38	CapitalSource, Cardica, Delta, US Airways: U.S.	The following companies are having unusual price changes in	0,16957144	neutral
09.09.08 09:55	Continental Air to Drop Year-Round Flights at I	Continental Airlines Inc., the U.S. carrier most dependent on	0,38010433	positive
09.09.08 10:24	Alaska Air to Put Runway-Collision Alerts in All	Alaska Airlines said it will equip its entire fleet with a crash-	0,55341804	positive
09.09.08 11:14	Air Canada Will Introduce Internet Service Nex	Air Canada, the country's largest carrier, will introduce	0,1351795	neutral
09.09.08 12:20	Ryanair Delays Edinburgh-Base Opening Becau	Ryanair Holdings Plc, Europe's biggest discount airline,	-0,2239045	negative
09.09.08 13:48	Delta Offers Discounted US Helicopter Service	Customers traveling in Economy Class on Delta Air Lines'	0,29532519	positive
09.09.08 15:54	Continental to Lay Off 148 Pilots; 326 Jobs Sav	Continental Airlines Inc. is laying off 148 pilots starting today,	0,47623107	positive
09.09.08 17:12	Continental to Trim Pilot Ranks by 7.3%, Union	Continental Airlines Inc., reducing its workforce to help	-0,0672399	negative
09.09.08 18:12	Tribune Says Old United Airlines Story Appeare	Tribune Co. said a 6-year-old article on United Airlines'	-0,7032858	negative
09.09.08 19:33	Tribune Says Link to Old United Story Was on V	Tribune Co. said a link to the 6-year-old article on UAL	-0,5967194	negative
09.10.08 01:51	China Southern to Open Six Overseas Offices t	China Southern Airlines Co., the nation's largest domestic	0,39159948	positive
09.10.08 07:47	Huntsman, Merck, Siemens, Enron, Nelnet in C	Huntsman Corp.'s financial performance has deteriorated	0,09159525	neutral
09.10.08 08:34	OMA's August 2008 Total Passenger Traffic De	Mexican airport operator Grupo Aeroportuario del Centro	0,64500326	positive
09.10.08 10:39	EU May Tighten Airline CO2 Cap to Loosen Cur	The European Union should tighten a future cap on carbon	-0,1051553	negative
09.10.08 11:47	Turkish Airlines Plans to Expand With Acquisiti	Turk Hava Yollari AO, Turkey's state-controlled airline, is	0,3381466	positive
09.10.08 12:10	U.S. FAA Should Audit Airline Safety Disclosure	U.S. aviation regulators should audit airlines' voluntary	-0,1535682	negative
09.10.08 12:52	American Airlines Urged by Attendants to Filte	American Airlines flight attendants are urging the carrier to	-0,566307	negative
09.10.08 13:04	JetBlue Says 2009 Capacity Won't Increase Mo	JetBlue Airways Corp. said it won't increase 2009 capacity	0,36145741	positive
09.10.08 14:32	American Air Attendants Urge Filters for Web	American Airlines flight attendants are urging the world's	-0,4365044	negative
09.10.08 15:15	U.S. Stock Options With Biggest Changes in Im	The following are the U.S. stock options that had the biggest	-0,11	negative
09.10.08 15:34	S&P/ASX 200 Stocks With Highest, Lowest Ave	The following tables show the highest and Lowest average	0,22666669	positive
09.10.08 15:53	FAA Should Audit Air Safety Disclosures, Panel	U.S. aviation regulators should audit airlines' voluntary	-0,1535682	negative
09.10.08 16:57	JetBlue Says 2009 Capacity Won't Increase Ov	JetBlue Airways Corp., once among the fastest-growing U.S.	0,17659691	neutral
09.10.08 17:01	American Air Attendants Urge Filters to Bar W	American Airlines flight attendants are urging the world's	-0,0185279	neutral
09.10.08 18:55	Tribune Says Confusion Over United Story Star	Tribune Co. said the confusion over a 2002 article on United	-0,3802516	negative
09.10.08 20:54	Tribune Says Confusion Over UAL Started With	Tribune Co. said the confusion over a 2002 article on UAL	-0,0379621	neutral
09.10.08 21:52	Kumho Asiana May Sell Kumho Life, Affiliates'	Kumho Asiana Group, owner of Daewoo Engineering &	0,30229545	positive
09.11.08 02:48	Kumho Asiana May Sell Kumho Life, Units' Sha	Kumho Asiana Group, owner of Daewoo Engineering &	0,30229545	positive
09.11.08 07:00	Slackening Demand, Climbing Intercontinental	Frankfurt Airport (FRA) welcomed 4,916,620 passengers in	0,28719699	positive
09.11.08 09:56	Venezuela to Reduce Flights by U.S. Airlines, U	Venezuela plans to reduce the number of flights offered by	0	neutral
09.11.08 09:56	Venezuela to Reduce Flights by U.S. Airlines, U	Venezuela plans to reduce the number of flights offered by	0,15000001	neutral
09.11.08 11:06	U.S. June Passenger Airline Traffic Data: Summ	U.S. passenger airlines carried 67.8 million passengers in	0	neutral
09.11.08 11:40	Ryanair Plane Returns to Dublin After Tail Touc	Ryanair Holdings Plc, Europe's biggest discount airline, said a	0,55000001	positive
09.11.08 12:25	Google Says Tribune Didn't Ask It to Stop Searc	Google Inc. said it wasn't asked by Tribune Co. to stop	-0,114248	negative
09.11.08 14:42	Continental Airlines, Diebold, Whole Foods: U.	The following companies are having unusual price changes in	0,45994401	positive
09.11.08 15:11	American, Continental, Southwest Cut Texas F	AMR Corp.'s American Airlines, Continental Airlines Inc. and	0,15270454	neutral
09.11.08 15:59	AMR, Continental, Southwest Cut Flights as Ike	AMR Corp.'s American Airlines, Continental Airlines Inc. and	0,0547356	neutral
09.11.08 16:13	Venezuela Notifies U.S. Airlines of Coming Flig	American Airlines, Delta Air Lines Inc. and Continental	0,5	positive
09.11.08 17:03	SEC Probing Circumstances Around UAL Stock	The U.S. Securities and Exchange Commission is probing	-0,2246067	negative
09.11.08 17:07	Allergan, CSX, Lehman, Sotheby's, Sunoco: U.S	The following companies had unusual price changes in U.S.	0,28105217	positive
09.11.08 18:22	Board Drops Plan Opposed by Unions Trying to	A U.S. board withdrew a plan that may have made it harder	-0,4740625	negative
09.11.08 23:01	FAA Urged to Produce New Rest Rules for Pilot	Pilots and safety experts are increasing pressure on the	-0,0645341	negative
09.12.08 02:38	Virgin Atlantic Steps Up Fight Against British A	Virgin Atlantic Airways Ltd., the U.K. carrier controlled by	0,07240003	neutral
09.12.08 03:33	Branson Vows to Fight BA-American `Monster	Richard Branson, chairman of Virgin Group Ltd., talks about	0	neutral
09.12.08 06:22	British Airways May Eliminate Hundreds of Ma	British Airways Plc, Europe's third-largest carrier, will offer	0,168652	neutral
09.12.08 08:10	Walsh Says British Airways `Accelerating' Job C	Willie Walsh, chief executive officer of British Airways Plc,	0,09031866	neutral
09.12.08 08:20	U.K.'s XL Travel Group Collapses, Stranding The	XL Leisure Group Plc grounded all flights and stranded	-0,16	negative
09.12.08 09:34	Gol Raised to `Overweight' at JPMorgan	Princeton, New Jersey, Sept. 12 (Bloomberg Data) -- Gol	0	neutral
09.12.08 11:20	American Air Job Cuts Won't Include Pilot Furl	American Airlines won't furlough any pilots as it eliminates	-0,260374	negative
09.12.08 11:22	Virgin Atlantic to Battle British Airways-AMR T	Virgin Atlantic Airways Ltd., the U.K. carrier controlled by	0,27938184	positive
09.12.08 16:07	Transat AT Raised to `Outperform' at RBC Capi	Transat AT Inc. (TRZ/B CN) was raised to ``outperform'' from	0,54000002	positive
09.12.08 16:18	Alaska Airlines to Cut Up to 1,000 Jobs, Trim Fl	Alaska Airlines will cut as many as 1,000 jobs, or about 10	0,07355967	neutral
09.12.08 16:20	American Air Job Cuts Won't Include Pilot Furl	American Airlines, the world's largest carrier, won't furlough	-0,0518049	negative
09.12.08 17:37	GM's Wagoner Says $25 Billion `Good' U.S. Loa	Rick Wagoner, chief executive officer of General Motors	0,01	neutral
09/13/2008 07:40	Lufthansa Seeks Deal With BMI, Virgin Atlantic	Deutsche Lufthansa AG is seeking an alliance with U.K.	0,0830445	neutral
09/14/2008 09:57	Aeroflot Plane Crashes in Central Russia, Killing	A Boeing Co. 737-500 jet flown by OAO Aeroflot's Aeroflot	-0,8395281	negative